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74th Congress
2d Session

COMMITTEE PRINT

WILDLIFE RESTORATION AND CONSERVATION

PROCEEDINGS

OF THE

NORTH AMERICAN WILDLIFE CONFERENCE

CALLED BY

PRESIDENT FRANKLIN D. ROOSEVELT

CONNECTING WING AUDITORIUM

AND

THE MAYFLOWER HOTEL

WASHINGTON, D. C.

FEBRUARY 3–7, 1936

Printed for the use of the
Special Committee on Conservation of Wildlife Resources

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In calling the North American Wildlife Conference for February 3–7, President Roosevelt said:

"My purpose is to bring together individuals, organizations, and agencies interested in the restoration and conservation of wildlife resources. My hope is that through this conference new cooperation between public and private interests, and between Canada, Mexico, and this country, will be developed; that from it will come constructive proposals for concrete action; that through these proposals existing State and Federal governmental agencies and conservation groups can work cooperatively for the common good."

GENERAL SESSIONS

MONDAY, 2 P. M.

Connecting Wing Auditorium, Constitution Avenue between Twelfth and Fourteenth Streets

F. A. SILCOX, *Chief, United States Forest Service, Chairman*

1. Opening remarks by the chairman.
2. Greetings from President Roosevelt, an address of welcome by Henry A. Wallace, Secretary of Agriculture.
3. Greetings from Mexico.
4. Greetings from Canada.
5. The Wildlife Crisis—Jay N. Darling, Des Moines, Iowa.
6. The Mexican Wildlife Situation, Sr. Juan Zinser, Mexico City.
7. The Administration of the Wildlife of Canada, Hoyes Lloyd, Ottawa, Canada. Announcements.

TUESDAY, 9:30 A. M.

Connecting Wing Auditorium, Constitution Avenue between Twelfth and Fourteenth Streets

HOYES LLOYD, Ottawa, Canada, *Chairman*

1. Opening remarks, Hon. Key Pittman, chairman, Senate Special Committee on Conservation of Wildlife Resources.
2. Why Concern Ourselves about Wildlife?
   (*a*) Economic Importance discussed, Roswell P. Rosengren, vice president, United States Junior Chamber of Commerce, Buffalo, N. Y.
   (*b*) Social Importance discussed, Mrs. Roberta C. Lawson, president, General Federation of Women's Clubs, Washington, D. C.
   (*c*) Importance to Youth discussed, L. W. Barclay, director of activities, Boy Scouts of America, New York City.
3. Discussion.

AFTERNOON SESSION, 2 O'CLOCK

SR. JUAN ZINSER, Mexico City, *Chairman*

4. Opening remarks, Richard M. Kleberg, United States House of Representatives.
5. The Work of the American Committee for International Wildlife Protection, Dr. John C. Phillips, Wenham, Mass.
6. Wildlife in the National Resources Picture, Frederic Delano, National Resources Committee, Washington, D. C.
7. Wildlife: Past, Present, and in the Future, William L. Finley, Portland, Oreg.
8. Organization, Cooperation, and Harmony in Wildlife Management, Lithgow Osborne, New York State Conservation Commissioner, Albany, N. Y.

WEDNESDAY, 9:30 A. M.

Connecting wing auditorium

JAY N. DARLING, *Chairman*

This entire day will be an open forum, the purpose of which is the formation of a general federation of wildlife interests.

It is the most important session of the conference and will undoubtedly have a definite bearing on the future of wildlife restoration.

THURSDAY, 9:30 A. M.

Connecting Wing Auditorium, Constitution Avenue between Twelfth and Fourteenth Streets

IRA N. GABRIELSON, *Chief, United States Biological Survey, Chairman*

1. Opening remarks—Hon. Harold L. Ickes, Secretary of the Interior.
2. The Solution of the Wildlife Restoration Problem.
   - (A) By education:
     - (1) In the Public Schools—Dr. John W. Studebaker, United States Commissioner of Education, Washington, D. C.
     - (2) Through the Extension Service—Dr. C. B. Smith, Assistant Director of Extension, United States Department of Agriculture, Washington, D. C.
     - (3) Through the Press—Tom Wallace, editor of the Louisville Times, Louisville, Ky.
     - (4) By Radio—Frank E. Mullen, The Radio Conservation Council, Radio Corporation of America, New York City.
     - (5) The Contributions of Non-sportsmen to Wildlife Conservation—John H. Baker, National Association of Audubon Societies, New York City.
   - (B) By management:
     - (1) By private agencies:
       - (*a*) Aldo Leopold, University of Wisconsin, Madison, Wis.
       - (*b*) L. J. Taber, president, National Grange, Columbus, Ohio.

AFTERNOON SESSION, 2 O'CLOCK

WILLIAM B. GREELEY, *Committee on Conservation of Forests and Wildlife, Campfire Club of America, Inc., Chairman*

Opening remarks—Former Senator Harry B. Hawes, Washington, D. C.

- (B) By management—(Continued):
  - (2) By public agencies:
    - (*a*) Elliott S. Barker, president, International Association of Game, Fish, and Conservation Commissioners, Santa, Fe N. Mex.
    - (*b*) Maj. Nicholas Biddle, president, Board of Game Commissioners, Commonwealth of Pennsylvania.
  - (*c*) Arthur L. Clarke, superintendent, State Board of Fisheries and Game, Hartford, Conn.
  - (*d*) Newell B. Cook, State Fish and Game Commissioner, Salt Lake City, Utah.
  - (*e*) Dr. Rudolf Bennitt, Natural History Survey, Columbia, Mo.
  - (*f*) F. A. Silcox, Chief, United States Forest Service.
  - (*g*) F. R. Carpenter, Director of Grazing, Interior Department, Washington, D. C.
  - (*h*) George M. Wright, National Park Service, Washington, D. C.
  - (*i*) John Collier, Commissioner, Bureau of Indian Affairs, Washington, D. C.
  - (*j*) Ernest G. Holt, United States Soil Conservation Service, Washington, D. C.
  - (*k*) Lt. Col. William H. Hobson, Fort Snelling, Minn.

FRIDAY, 9:30 A. M.

(For special morning sessions see pp. 14, 15, and 16.)

1. Opening remarks—Hon. A. Willis Robertson, chairman, House Special Committee on Wildlife Conservation.
   A North American Program for Wildlife Restoration.
2. Proposals for the Solution of the Fisheries Conservation Problem—Frank T. Bell, Commissioner, Bureau of Fisheries, Washington, D. C.
3. A National Program for Wildlife Restoration—I. N. Gabrielson, Chief, United States Bureau of Biological Survey, Washington, D. C.
4. The Mexican Program—Sr. Juan Zinser, Mexico City.
5. The Canadian Program—Hoyes Lloyd, Supervisor of Wildlife, National Parks of Canada.
6. Harmonizing Conflicting Interests in Land Management—P. S. Lovejoy, Michigan Conservation Commission, Lansing, Mich.

AFTERNOON SESSION, 2 O'CLOCK

F. A. SILCOX, *Chief, United States Forest Service, Chairman*

This session will be devoted to the hearing of resolutions and reports of committees.

SPECIAL MORNING SESSIONS

MONDAY MORNING

FARMER-SPORTSMAN COOPERATIVES

Chinese Room

Chairman: W. C. ADAMS, Director, Division of Fish and Game, Albany, N. Y.
Committee: H. D. RUHL, superintendent, Division of Game, Lansing, Mich.; CHESTER H. GRAY, American Farm Bureau Federation, Washington, D. C.; CAPT. H. J. BURLINGTON, secretary, Board of Fish and Game Commissioners, Trenton, N. J.

1. Development of the Farmer-Sportsman Cooperatives in New Jersey—Lester G. MacNamara, Board of Fish and Game Commissioners, Trenton, N. J.
2. In Wisconsin—Aldo Leopold, University of Wisconsin, Madison, Wis.
3. In Nebraska—Frank B. O'Connell, Director of Conservation, Lincoln, Nebr.
4. In North Carolina—J. D. Chalk, Commissioner of Game and Inland Fisheries, Raleigh, N. C.
5. In Iowa—Logan Bennett, United States Biological Survey.

FISH MANAGEMENT

North Room

Chairman: NEWELL B. COOK, State Fish and Game Commission, Salt Lake City, Utah.
Committee: T. H. LANGLOIS, Chief, Bureau Fish Propagation, Columbus, Ohio; Dr. EMMALINE MOORE, New York Conservation Department, Albany, N. Y.; GLENN C. LEACH, United States Bureau of Fisheries, Washington, D. C.

1. Using Municipal Waters to Provide More Fishing—P. D. Aldrich, superintendent, Municipal Fish Hatcheries, Tulsa, Okla.
2. Fish Yield on National Forests—Leslie S. Bean, United States Forest Service, Milwaukee, Wis.
3. Importance of Forage Fishes (slides)—G. P. Cooper, Institute for Fisheries Research, Ann Arbor, Mich.
4. Restoration of the Atlantic Salmon to the Penobscot River—Raymond W. Dow, Penobscot River Salmon Committee, Bangor, Maine.
5. The Test Stream and Fish Management—Russel Lord, United States Bureau of Fisheries, Pittsford, Vt.

6. Outline of Canada's National Policy on Fish Culture—J. A. Rodd, Director of Fish Culture, Ottawa, Canada.
7. Fostering Cooperative Fish Rearing—Glenn C. Leach, United States Bureau of Fisheries, Washington, D. C.
8. Iowa Fish Management Plan—Fred Schwob, chief, Fish and Game Division, Des Moines, Iowa.
9. The Rochester, New York Project (slides)—W. Bruce Large, M. D., Rochester, N. Y.
10. Essential Considerations for Fish Management in Lakes (slides)—R. W. Eschmeyer, Institute for Fisheries Research, Ann Arbor, Mich.

UPLAND WILDLIFE RESEARCH

Mezzanine A

Chairman: J. H. Frison, chief, State Natural History Survey, Urbana, Ill.
Committee: L. E. Hicks, Soil Conservation Service, Zanesville, Ohio.

1. Grouse Management Studies—Dr. Ralph T. King, University of Minnesota, St. Paul, Minn.
2. Cottontail Rabbit Management—Dr. R. E. Trippensee, Massachusetts State College, Amhurst, Mass.
3. Management of Wild Turkeys—H. L. Stoddard, Thomasville, Ga.
4. Differences in Nutritive Values of Winter Game Foods—Dr. Paul L. Errington, Iowa State College, Ames, Iowa.
5. Pillsbury Game Management Project (New Hampshire)—J. P. Miller, United States Bureau of Biological Survey.
6. Recent Pennsylvania Game Field Investigations—Richard Gerstell, Pennsylvania Board of Game Commissioners.

Tuesday Morning

GAME BREEDING

East End Presidential Room

Chairman: Malcolm Dunn, superintendent, State Game Farms, Forked River, N. J.
Committee: Otto Beyer, Beyer Game Farms, Portage, Wis.; Marvin O. Poyner, New York State Conservation Department, Albany, N. Y.

1. Breeding Waterfowl for Replacing Wild Stock—Wallace Grange, Ephraim, Wis.
2. Modern Brooding Methods for Game Birds:
   (a) Quail—Marvin O. Poyner, New York.
   (b) Pheasants—C. W. Wessell, Pennsylvania Board of Game Commissioners, Harrisburg, Pa.
3. Game Bird Standards of Perfection—Dr. Miles D. Pirnie, director, W. K. Kellogg Bird Sanctuary, Battle Creek, Mich.
4. Disinfecting the Game Farm—Miss S. Costigan, General Laboratories, Inc., Philadelphia, Pa.
5. Releasing Larger Pheasants—C. W. Wessell, Board of Game Commissioners, Harrisburg, Pa.

FORESTS AND FOREST WILDLIFE

Mezzanine A

Chairman: Dr. H. H. T. Jackson, United States Bureau of Biological Survey.
Committee: Robert Darrow, New York Conservation Department, Albany, N. Y.; Prof. A. A. Nichol, University of Arizona, Tucson, Ariz.

1. Isle Royal Moose Studies (slides)—Paul Hickie, Commissioner of Conservation, Lansing, Mich.
2. Relation of Burning to Timber and Wildlife—H. L. Stoddard, Thomasville, Ga.
3. Deer Feeding Experiments and Western Range Management—Prof. A. A. Nichol, University of Arizona, Tucson, Ariz.
4. Forest Carrying Capacity and Deer Food Problems—Henry E. Clepper, Forest Research Institute, Mont Alto, Mont.

5. The Minnesota Caribou Herd—Gustav Swanson, Department of Conservation, St. Paul, Minn.
6. Forest Management and Wildlife Management—W. L. McAtee, United States Bureau of Biological Survey.
7. Reindeer Drive from Alaska to the Delta of the Mackenzie River, by a Canadian representative.

STREAM AND LAKE IMPROVEMENT

Chinese Room

Chairman: Dr. Carl L. Hubbs, University of Michigan, Ann Arbor, Mich.
Committee: Dr. John R. Greeley, New York Conservation Department, Albany, N. Y.; Dr. H. S. Davis, United States Bureau of Fisheries; Dr. A. S. Hazzard, Institute for Fisheries Research.

1. Lake and Stream Improvement in Michigan—Clarence M. Tarzwell, United States Forest Service.
2. Lake and Stream Improvement in New York (slides)—Dr. John R. Greeley, Conservation Department, Albany, N. Y.
3. Lake and Stream Improvement in Pennsylvania—O. M. Deibler, Commissioner of Fisheries, Harrisburg, Pa.
4. Development of Fisheries in Impounded Waters—Edward C. M. Richards, chief forester, Tennessee Valley Authority, Knoxville, Tenn.
5. Lake and Stream Improvement on the National Forests—H. S. Davis, United States Bureau of Fisheries; C. E. Rachford, United States Forest Service.
6. Check Dams in Arid Regions—P. R. Needham, United States Bureau of Fisheries.
7. Food Plantings for Fish—Dr. Carl L. Hubbs, University of Michigan, Ann Arbor, Mich.
8. Stream Improvement as Related to Erosion—Robert Ritzler, Dayton, Ohio.

WILDLIFE DISEASE AND POPULATION CYCLES RESEARCH

Mezzanine A

Chairman: Dr. J. E. Shillinger, United States Bureau of Biological Survey.
Committee: E. C. O'Roke, University of Michigan, Ann Arbor, Mich.; R. E. DeLury, assistant director, Royal Dominion Observatory, Ottawa, Canada.

1. Progress Report of Wildlife Disease Studies for 1935—R. G. Greene, University of Minnesota; J. E. Shillinger, United States Bureau of Biological Survey.
2. Discovery of the Organism of Ulcerative Enteritis—Dr. L. C. Morley, Mrs. Psyche Wetmore, United States Bureau of Biological Survey.
3. Deer Lungworm Situation in Michigan (slide)—Dr. E. C. O'Roke, University of Michigan, Ann Arbor, Mich.
4. An Hypothesis of Wildlife Cycles—Ralph T. King, University of Minnesota, St. Paul, Minn.
5. Fluctuations of Bobwhite Quail in the South—Dr. I. N. Kennedy, Tallahassee, Fla., executive secretary, Department of Game and Fresh Water Fish.
6. Regional Types of Response of Wildlife to the Sunspot Cycle (slides)—Dr. R. E. DeLury, assistant director, Dominion Observatory, Ottawa, Canada.
7. Tetrameres Crami Swales, 1933—an Important Parasite of Ducks in North America (slides)—Dr. W. E. Swales.

RESEARCH IN WATERFOWL PROBLEMS

Jefferson Room

Chairman: Dr. Miles D. Pirnie, Director, W. K. Kellogg Bird Sanctuary, Battle Creek, Mich.
Committee: Clarence Cottam, United States Biological Survey; Hoyes Lloyd, National Parks of Canada, Ottawa, Canada; Logan Bennett, United States Biological Survey.

1. Iowa Waterfowl Nesting Studies—Logan Bennett, United States Biological Survey.

2. Eel Grass and Other Waterfowl Foods—Present Status and Future Prospects—Clarence Cottam, United States Biological Survey; Harrison Lewis, Chief, Federal Migratory Bird Officer, Ontario, Ottawa and Quebec.
3. Michigan Waterfowl Management Studies—Dr. Miles D. Pirnie, director, W. K. Kellogg Bird Sanctuary, Battle Creek, Mich.
4. Mosquito Control and Waterfowl—Dr. W. S. Bourn, United States Biological Survey.
   Discussion—Dr. R. D. Glasgow, State entomologist, New York State Museum, Albany, N. Y.
5. Studies in Waterfowl Abundance—F. C. Lincoln, United States Biological Survey.
6. The Canadian Waterfowl Situation, 1935—Hoyes Lloyd, National Parks of Canada, Ottawa, Canada.
7. Restoration of Canadian Duck Breeding Grounds—John C. Huntington, More Game Birds in America, New York City.
8. The Fundamentals of the Wild Duck Situation, 1936—P. A. Taverner, National Museum of Canada, Ottawa.

POLLUTION

Chinese Room

Chairman: Senator AUGUSTINE LONERGAN.
Committee: S. B. LOCKE, Izaak Walton League of America, Chicago, Ill.; M. M. ELLIS, Columbia, Mo.; GROVER C. LADNER, Assistant Attorney General, Philadelphia, Pa.; CLEM SHAVER, Reconstruction Finance Corporation, Washington, D. C.

1. Pollution Abatement Plan of National Resources Committee—Abel Wolman, Water Resources Committee of National Resources Board, Baltimore, Md.
2. Tri-State Anti-Pollution Commission—Charles Holmquist, director Division of Sanitation, State Health Department, Albany, N. Y.
3. Pollution of Streams from Mining Operations—Kenneth A. Reid, Connellsville, Pa.
4. Oil Pollution in Coastal Waters—P. S. Galtsoff, United States Bureau of Fisheries, Washington, D. C.
5. The Effect of Oil Pollution on Waterfowl—F. C. Lincoln, United States Biological Survey, Washington, D. C.
6. Effect of Pollution on Fish—M. M. Ellis, Columbia, Mo.
7. Pollution of Streams from Pulp and Paper Mills—C. E. Curran, Forest Products Laboratory, United States Forest Service, Madison, Wis.

FRIDAY MORNING

PRACTICAL WILDLIFE MANAGEMENT

Chinese Room

Chairman: W. L. MCATEE, United States Biological Survey.
Committee: F. C. EDMINSTER, New York State Conservation Department, Albany, N. Y.; L. G. MCNAMARA, New Jersey Board of Game Commissioners.

1. Permanent Food and Cover for Wildlife—Neil Hosley, Harvard Forest, Petersham, Mass.
2. Practical Waterfowl Management—J. C. Salyer, United States Biological Survey.
3. From Pitch Pine and Scrub Oak to Quail—Dr. Gardner Bump, director, Bureau of Game, New York Conservation Department, Albany, N. Y.
4 Coordination of Farm Game Management with Usual Farm Practice—H. D. Ruhl, superintendent, Division of Game, Lansing, Mich.
5. Hawks and Owls—A Conservation Problem—Warren F. Eaton, National Association Audubon Societies, New York, N. Y.
6. Wildlife as an Agricultural Resource—Dr. W. A. Schoenfeld, dean, Oregon State College, Corvallis, Oreg.
7. Game Management Demonstration Areas—H. L. Stoddard, Thomasville, Ga.
8. The C. C. C. Rehabilitates Waterfowl Habitat—W. F. Kubichek, United States Biological Survey.

FUR RESOURCES MANAGEMENT

Mezzanine A

Chairman: Col. P. B. Fouke, St. Louis, Mo.
Committee: Frank G. Ashbrook, United States Biological Survey, Washington, D. C.; Ward C. Bower, Bureau of Fisheries, Washington, D. C.; C. E. Rachford, United States Forest Service, Washington, D. C.; George M. Wright, National Park Service, Washington, D. C.; Ernest G. Holt, Soil Conservation Service, Washington, D. C.; W. J. Hamilton, Jr., Cornell University, Ithaca, N. Y.; D. C. Mills, 150 Lafayette Street, New York, N. Y.; Henry P. Davis, American Wildlife Institute, Washington, D. C.; Chester Gray, American Farm Bureau Federation, Washington, D. C.

The Canadian situation with respect to fur resources will be presented by representatives from the Dominion.

There will be no set speeches. A tentative outline setting forth the problems of fur resources and Federal and State policies will be organized by the committee and discussed at this meeting, the idea being to formulate a plan for the restoration and conservation of fur resources to be submitted later to the general conference.

THE PROBLEM OF VANISHING SPECIES

Jefferson Room

Chairman: Dr. T. S. Palmer, Washington, D. C.
Committee: Joseph H. Dixon, National Parks Service; Dr. A. A. Allen, Professor of Ornithology, Cornell University, Ithaca, N. Y.; Wm. L. Finley, Portland, Oreg.

1. The Trumpeter Swan—Ben Thompson, National Parks Service, Washington, D. C.
2. The Sierra Big Horn Sheep—Joseph S. Dixon, National Parks Service, Berkeley, Calif.
3. The Sand Hill Crane in the Lake States (slides)—Franklin S. Henika, Madison, Wis.
4. The Grizzly Bear—George Bagley, National Park Service, Washington, D. C.
5. The Pronghorn Antelope in the Southwest—Dr. Walter B. Taylor, United States Biological Survey, College Station, Tex.
6. How They Meet the Problem in Europe—Dr. T. Gilbert Pearson, President Emeritus, National Association of Audubon Societies, New York, N. Y.
7. A Plan for National Conservation—Arthur Newton Pack, President, American Nature Association, Washington, D. C.
8. Last Call for Saving Game—William T. Hornaday, Permanent Wildlife Protection Fund, Stamford, Conn.

RELATED MEETINGS

Monday, February 3, 12:15 Noon

Rooms 237–238

International Association of Game, Fish and Conservation Commissioners and the American Fisheries Association.

Tuesday, February 4, 10:30 A. M.

Suite 276

Association of Middle Atlantic States Game and Fish Commissioners.

Tuesday, February 4, 2 P. M.

Suite 276

Federal Elk Commission.

TUESDAY, FEBRUARY 4, 7:30 P. M.

Mezzanine A

Wild Turkey Conservation Association.

WEDNESDAY, FEBRUARY 5, 12:30 P. M.

The Cosmos Club

American Game Association, Board of Directors (luncheon).

THURSDAY, FEBRUARY 6, 11 A. M.

North Room

American Wildlife Institute, Board of Trustees (luncheon).

THURSDAY, FEBRUARY 6, 6:30 P. M.

North Room

National Committee on Wildlife Legislation (dinner).

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(Prepared for the Biological Survey edition)

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THE CONFERENCE BACKGROUND

THE NORTH AMERICAN WILDLIFE CONFERENCE succeeded the AMERICAN GAME CONFERENCE, which had been held in New York City in the interests of wildlife protection and management annually since March 1, 1915, under the auspices of the American Game Association (chartered as the American Game Protective and Propagation Association). First meeting as a National Conference on American Game Breeding, it was later known as the National Game Conference, as its work extended to all phases of game conservation and administration; and then, because wildlife problems throughout North America were considered at its open forum sessions, it was termed the American Game Conference, in order more fully to express its international character.

When the American Game Association merged into the newly organized AMERICAN WILDLIFE INSTITUTE on September 1, 1935, it relinquished sponsorship of the annual conference. The President of the United States issued the call for this twenty-second annual assemblage. It is planned to continue the conferences under the present designation.

The principal papers of the earlier conferences were printed in *American Game,* the official magazine of the sponsors, and the transactions of the last seven conferences were widely distributed in pamphlet form. Back numbers of each may be obtained at a nominal charge from the American Wildlife Institute, Washington, D. C.

PROCEEDINGS OF THE NORTH AMERICAN WILDLIFE CONFERENCE (TAKING THE PLACE OF THE TWENTY-SECOND AMERICAN GAME CONFERENCE)

MONDAY AFTERNOON, FEBRUARY 3, 1936

The North American Wildlife Conference called by President Franklin D. Roosevelt for February 3–7, 1936, at Washington, D. C., convened in the Connecting Wing Auditorium at 2:15 p. m., Mr. F. A. Silcox, Chief of the Forest Service of the United States, presiding.

Remarks of Chairman F. A. Silcox

Chairman Silcox. Representatives of foreign governments, governors and representatives of governors, delegates from the many civic, wildlife, and other associations of the several States, sportsmen, scientists, and laymen, ladies and gentlemen all:

We are assembled here in a common effort to help restore and conserve the vanishing wildlife resources of a continent. This is a serious purpose. It has widespread scientific interest and significance. Its esthetic, spiritual, and recreational values are enormous. It affects the social and economic welfare of some 150 millions of people in three great nations.

It seems inevitable to me that this conference should have been called; inevitable that it should have been called by the President of the United States; inevitable that the President who called it should have been a Roosevelt. For Theodore Roosevelt and Franklin Delano Roosevelt are both indelibly identified with the principle of conservation of our natural resources. Each of them has anticipated the need for it and has recognized the vital relations which it bears to an economy that has for its foundation some degree of security and stability for the people of a nation. Both have held, always, that conservation is a matter of immediate, vital concern to all regions and all nations; to all groups and all people, irrespective of business, political, or other affiliations.

This is the spirit in which the North American Wildlife Conference was called; the spirit in which I accepted appointment as its chairman; the spirit in which you as representatives from every nation, State, and interested group in North America have assembled here. It is the spirit in which your distinguished committee prepared the agenda which assures each of you an opportunity to make known his viewpoints and beliefs, to discuss and offer constructive suggestions. It is the spirit with which this conference will conduct its deliberations and arrive at its conclusions. It is, in fact, the spirit of true democracy.

By its very nature this conference is, in effect, a meeting of the peoples of a continent. It is entirely autonomous. Its perpetuation, its future aims, aspirations, and methods of representation are subject to its own decisions. The hope is that through its deliberations new cooperation between private, public, and international interests will develop; that from it will come constructive proposals; that through these proposals there may be evolved such intelligent, concerted, and cooperative action as will help restore and conserve some semblance of our original wildlife resources.

This is a large task. It has certain very practical limitations. Pioneer conditions can never be restored. We may long for them, but we must admit that never again will it be possible for man to see in the valley of the Yellowstone what Captain Reynolds described in 1860 as a tract of 40 or 50 square miles so thickly covered with buffalo that it looked like a small pasture into which a large drove of cattle had been turned for a single night.

We know, too, that never again will the broad valleys of the upper Missouri support, as the Lewis and Clark journal reveals that they did in 1805, an aggregation of wildlife, including buffalo, elk, antelope, deer, moose, big-horn sheep, grizzly bear, prairie chicken, geese, and ducks, that for number and variety exceeded anything the eye of man had ever looked upon.

These pictures of early abundance are typical of pioneer days in the West. Comparable conditions once existed in the North, the South, and the East. The country was virgin then, with a biotic balance in fauna and flora undisturbed by the white man's presence. Since then much has happened. With the building of western railroads, buffalo were killed by the tens of thousands for their tongues alone; hundreds of thousands were slaughtered for their hides. Elk were killed for a pair of tusks; deer and other elk for their hides. Huge construction camps were fed chiefly on antelope. Then, to help support the rapid influx of settlers, fences were built, sod was plowed under, ranches appeared, prairies were pastured by sheep and cattle until original environments largely disappeared and with them, much of our wildlife.

In addition, then, to the slaughter and waste of pioneer days, this destruction of favorable environments has in itself been a major cause of our present wildlife plight. And it is now one of the obstacles to be overcome in solving the problem of restoring our wildlife resources.

Wildlife environments cannot now be restored to those pioneer conditions which once existed on broad areas which are now in urban and rural occupancy. That is neither physically possible nor socially desirable. But they can be restored to the extent that wildlife may again play the part it should in the social and economic life of a continent; we can still do a great deal, through improving environments, to better the present wildlife conditions on them. And it is after all the present rather than pioneer conditions with which we now must deal.

How may these and other things be done? And where, and by what agencies? To gather and make available information on these points and about other pertinent facts and discoveries, is one of the purposes of this conference. Opportunities for discussion are provided in a series of carefully planned forenoon sessions. I urge

wide participation in them, for clear understandings and honest approaches to such problems are essential to the restoration and conservation of North American wildlife.

On many of these problems divergent points of view are held. Differences in some cases are between individuals. In others they are between technical and professional groups or between laymen and technicians; between regional groups or between groups which represent public and those which represent special interest. So long, however, as these differences are honestly held and at this conference are honestly and clearly expressed, they should help both to define problems with which we are faced and to devise practicable methods to solve them. Both these things spell real progress toward a common goal.

There is need for progress, for by comparison with pioneer conditions, the present wildlife picture is in most sections of the United States one of scarcity or want. Buffalo, reduced from former millions to some 4,400 head, are confined very largely in a semidomesticated state to preserves and reservations. One species of white-tailed deer, which formerly roamed western Washington, is extinct. The last white-tailed deer is reported to have disappeared from Yellowstone Park in the winter of 1923–24. Prong-horned antelope, now on the increase within reservations and refuges, are nevertheless reduced from some 30 to 40 millions to an estimated sixty-odd thousand.

Mountain goats, moose, many species of migratory waterfowl, and grizzly bear are scarce. It is a hard struggle for them to hold their own. Elk were so decimated that in 1904 domestication was urged as the only practical method of preservation. Food fish in the Great Lakes and in long stretches of both coastal waters are approaching exhaustion. Game and food fish in most major rivers and streams are gone or reduced to a shadow of their former numbers. Certain species of songbirds are so scarce as almost to be classed as museum specimens. Upland birds and fur bearers, existing as scattered remnants of former abundance, are still declining. Canvasback and redhead duck are on the way out. The whir of heath hen and passenger pigeon is gone from the land.

Pastures have replaced prairies, dust-storms becloud and befoul vast areas which were once wildlife breeding grounds. On national parks and national forests wildlife is increasing, but much of our privately owned range land and public domain is depleted. Streams and harbors are polluted by municipal and industrial wastes. Fences and "no trespass" signs greet devotees of camera, rod, and gun. Traditional opportunities and joys of the hunt are increasingly curtailed and restricted. Political expediency is too often the rule in wildlife affairs. Over the length and breadth of the land fishermen and hunters, bird lovers and recreationists, city dwellers and urban folk, fathers and sons, scientists, sportsmen, and laymen are disheartened and discouraged at conditions which you who represent them here know so well.

It was with these conditions clearly in mind that President Roosevelt issued his call and set the dates for this North American Wildlife Conference. It was a clear call and a clarion one. Recognizing no single region or no single group, it was addressed to the millions of people who individually and in thousands of groups, societies, unions, and leagues, have worked valiantly and long to promote

local and group interest in certain phases of wildlife restoration and conservation.

Our President's call was, then, a national and an international one. It recognized the broad wildlife plight, and the urgency of it. Through the medium of this conference and the open covenants which he hopes it may bring forth, his call provides an opportunity to remedy that plight.

I have every confidence that the conference will in good faith and with a high heart make the most of this opportunity. Certainly it is representative enough to do so. Certainly it has within itself and at its command the brains, the intelligence, and the expert knowledge to do so. Its members and their constituents have, too, ample background, a wealth of practical experience, the common sense to look to the past for guidance but not blindly to follow the past. And I know the men and women here have the courage to propose such new methods and adopt such bold action as may be necessary successfully to accomplish the common purpose.

But with all the brains, all the experience, all the courage and all the high resolve that is gathered here, that purpose cannot be accomplished if individuals and groups stick to their own particular lasts or fail of such a practical approach as will assure due consideration to economic requirements of existing social structures. If wildlife is to be restored and conserved, all factors must be weighed and evaluated and individual action and unconcerted group and regional action must be correlated, coordinated, and fused into cooperative, national, and international planning and action for the good of all.

It is unnecessary to take any man's word for the need for this. Look for a moment to the past, for there ample confirmation lies. Wildlife organizations have existed for many years. Their numbers have been, and are, in the thousands; the number of their conscientious, courageous, zealous members mounts to many millions. Their potential strength has been, and is, enormous. Working long and faithfully and hard, they have accomplished certain things. But in all the years of work they have had neither a common program nor a single, effective, nonpartisan, central organization. For such a purpose as restoration and conservation of the wildlife of a nation or a continent, they have, therefore, to a large extent been leaderless, rudderless, and inarticulate; their work has often been at cross purposes; their results an indiscernible ripple in the relentless, ever-ebbing wildlife tide.

This conference offers a way out. It can be effectively articulate. It can lay the groundwork for a united national wildlife program. Without disturbing existing organizations, invading occupied fields of activity, or usurping a single sacred prerogative, it can through your initiative and determination affiliate all wildlife organizations and interests; can create a single, powerful union through which the potential strength of thousands of affiliates and millions of their own individual members may effectively be brought to bear upon that common objective, the restoration and conservation of North American wildlife.

By direction of your citizens' committee, which, as you know, is composed of 25 outstanding conservation leaders, certain tentative proposals for organization will later be submitted for your consider-

ation. When time for action comes, I urge you to remember that by its very nature this conference is in effect a meeting of the peoples of a continent; that it is entirely autonomous; that in accordance with the spirit of true democracy its future aims, aspirations, and methods of doing business are in its own hands.

This conference provides, then, three major opportunities. One is to learn about facts, discoveries and information pertinent to wildlife and the wildlife situation. Another is to develop an adequate national and international wildlife program. A third is to organize a permanent affiliation of all wildlife interests and groups; to create one central organization so articulate, so powerful, and so effective that real progress in restoring and conserving the vanishing wildlife resources of a continent can no longer be prevented.

Ladies and gentlemen, on behalf of the President of the United States, at whose invitation we are assembled here, I now declare the North American Wildlife Conference formally in session. And I have the privilege of presenting the Honorable Henry A. Wallace, Secretary of Agriculture, who brings to you a message from the Chief Executive. [Applause.]

Remarks of Hon. Henry A. Wallace

Hon. Henry A. Wallace (Secretary of Agriculture). Mr. Chairman, ladies and gentlemen of the North American Wildlife Conference: It is appropriate, it seems to me, that the first statement formally made should be a statement from the President, and I have received such a statement this morning. It reads as follows:

To the North American Wildlife Conference:

I regret my inability to extend a personal welcome to you or to participate personally in your discussion. Because this is impossible, I have asked Secretary Wallace to convey my best wishes for a most successful and profitable meeting.

It has long been my feeling that there has been lack of a full and complete public realization of our wildlife plight, of the urgency of it, and of the many social and economic values that wildlife has to our people. This, and my firm belief in the ability of the American people to face facts, to analyze problems, and to work out a program which might remedy the situation, is what impelled me to call the North American Wildlife Conference.

Our present wildlife situation is more than a local one. It is national and international. I sincerely hope that with the help of good neighbors to the north and south of us, your conference will unite upon a common purpose and a common program.

You have been told that this conference is an open forum; that it is entirely autonomous; that its future is subject to its own decisions. This is as it should be, for it makes it possible for you as representatives of thousands of wildlife organizations with millions of interested and zealous members to make effective progress in restoring and conserving the vanishing wildlife resources of a continent.

Sincerely,

Franklin D. Roosevelt.

[Applause.]

And now I may say, on behalf of the Department of Agriculture as well as on behalf of the entire administration, that we are exceedingly appreciative of the presence of the representatives from Canada and Mexico; we are exceedingly appreciative of the fact that all of you are here; that not only are there representatives of the Federal departments and bureaus dealing with wildlife, but also representatives of the States; and especially are we happy that

there are represented here the many private organizations. We express the hope that before this meeting adjourns these varied agencies, being impressed by the urgency of the problem over the entire North American Continent, will agree upon the main essentials of a broad program, no matter how irritating some of the minor differences may be. If we can proceed in that spirit of unity toward the major objective, we will not allow precious time to pass—that precious time which has passed and brought some of our valued species of wildlife near to the point of extinction. We are now, all of us, so impressed by what lost time has done that I am convinced we are willing to pull together over this entire continent for this objective as we never have done before. [Applause.]

Chairman SILCOX. Members of the North American Wildlife Conference: We are delighted to have with us Sr. Juan Zinser, representing the Mexican Government, who will bring you a message from the President of Mexico. [Applause.]

REMARKS OF SR. JUAN ZINSER

Sr. JUAN ZINSER (speaking in Spanish). It is a high honor for me to present to you the most cordial salutation of the President of the United Mexican States, Gen. Lazaro Cardenas, and I hope this conference will accomplish its noble purpose and will help to perpetuate the friendship of the nations taking part in this conference—the United States of America, Canada, and Mexico. [Applause.]

Chairman SILCOX. We are also delighted to have with us Mr. J. B. Harkin, Commissioner of National Parks of Canada, who will bring to us a message from the Premier of Canada. [Applause.]

REMARKS OF MR. J. B. HARKIN

Mr. J. B. HARKIN. Mr. Chairman, Mr. Secretary, and members of the Wildlife Conference: I am directed by the Prime Minister of Canada to read his message to you on his behalf:

It gave me great satisfaction to learn that the Government of the United States has called together a conference for the purpose of discussing wildlife conservation on the North American Continent.

The treaty between the United States and Canada for the protection of migratory birds indicates the interrelation of interests between our countries in that phase of wildlife conservation.

Following the policy established by that treaty, Canada is pleased to join with the United States of America and the Republic of Mexico in the present effort to advance the cause of conservation of North American wildlife, to the end that the full economic and esthetic possibilities of this great and distinctive resource may not only be enjoyed by the present generation but be handed down unimpaired for the future citizens of this continent.

On behalf of the Government and the people of Canada, I extend all good wishes for success in your deliberations, in the confident hope that the conference will result in much benefit to the cause yon are espousing.

[Applause.]

Chairman SILCOX. I am delighted again to present Sr. Juan Zinser, who will present a paper on "The Mexican wildlife situation." [Applause].

REMARKS OF SR. JUAN ZINSER

Sr. JUAN ZINSER (Mexico City). Mr. Chairman and delegates: It is one of the most pleasing experiences of my whole life to attend

this conference, which stands for the spiritual union of three peoples: the United States of America, Canada, and Mexico, all three destined to be united by unshakable friendship, and I feel it an honor at the same time to collaborate in a work of such great importance as that of protection of wildlife against indiscriminate hunting and exploitation, in order to allow it to propagate species for the benefit of the community as a whole.

By order of the President of the United States of Mexico, Gen. Lazaro Cardenas, the Department of Forests, Game, and Fish has been pleased to appoint me to attend this conference, and to set forth, as I shall now briefly proceed to do, the conditions under which a number of our wild animals live.

The Department of Forests, Game, and Fish established in January 1935 by Presidential decree, has drawn up the program for its work from a viewpoint essentially involving conservation of natural resources. The care of our woods and reforestation of denuded areas is its main purpose, inasmuch as these resources are essential to the life not only of man himself, but of the wild animals living in their depths, for there they find food and shelter, so that it necessarily follows that said department also cares for wildlife and takes such steps as may be necessary to prevent extinction of any species and to supervise their rational use for sport, food, trade, and industry.

Conservation of wildlife in years gone by had been neglected, for lack of proper and constant supervision had made it impossible to enforce legal ordinances enacted for this purpose. Hunting was, as a general rule, practiced without any restrictions whatsoever. The wild animals of each section were not studied, nor were their breeding habits and seasons the object of attention, so that no precise data were available in regard to the number of animals of each species killed every year.

Mexico's natural fauna, which is very rich, has not suffered actual extinction of any species, but its numbers have been sadly depleted and the Government has realized in time that all must be protected and has enacted laws and provisions to that end. For this purpose it has absolutely prohibited hunting of wild sheep and antelope in order to allow restocking of their natural range on a sufficient scale.

The deer family constitute the most valuable members of Mexico's wildlife for hunting purposes and is subdivided into the following species:

1. Bura or blacktail (*Odocoileus*). Mule Deer.
2. Whitetail deer or salton (*Odocoileus*).
3. *Temazate* or *guasupita;* the Brockets (*Mazama*).

The mule deer is extensively hunted, especially in the northern border States, by American hunters who come to Mexico for the purpose, and by the Kickapoo Indians. This tribe lives wholly by the chase. Its headquarters are at Nacimiento, near Muzquiz, Coahuila, and its hunting grounds spread over the States of Coahuila, Chihuahua, and Nuevo Leon.

The Indians usually keep and utilize only the hides and portions of the meat of the deer, leaving the remainder to rot. They have lived in that section since the times of President Juarez, and enjoy a number of special privileges such as hunting, which often degenerates into slaughter.

The *bura* or mule deer ranges over the States of Sonora (and the adjacent territory of Lower California), Chihuahua, Coahuila, Nuevo Leon, San Luis Potosi, Durango, and Zacatecas. West of Hermosillo, Sonora, on Tiburon Island and in certain sections of Lower California, there is a variety of this deer notable for its large size, which deserves special care to save it from extinction.

Whitetail Deer or salton (*Odocoileus*).

The whitetail deer, subspecies of which are found all over Mexico, abounds in certain regions. There are places where its meat forms the staple food of the inhabitants. Its hides are exported on a large scale, enormous quantities being shipped to the United States and Germany.

For the last 2 years export of and trade in the hides and flesh of this species has been prohibited, this marking a decisive step forward for conservation of this beautiful animal.

A considerable lessening of the numbers of these valuable Cervidae has been noted in the vicinity of towns and also in many other places which improved means of communication have brought within easy reach of hunters.

In the Yucutan Peninsula, the Indians are hunters by descent and tradition, and the very few not possessing firearms resort to ingenious and effective traps for the capture of this animal. A small number of hunters do respect closed seasons and other ordinances on the subject. The use of lanterns for night shooting has not spread very much, but is sometimes resorted to notwithstanding the fact that it is forbidden.

The Brockets (Mazama) *Temazate* or *Guasupita*.

The *Temazate*, this being the Aztec name of the Brocket or *Mazama* dwells in tropical forests from southern Vera Cruz to Quintana Roo. Its habitat makes hunting much harder than in the case of the other deer, and serves as an effective defense against its pursuers.

The Antelope or *Berrendo* (*Antilocapra americana, mexicana*).

Inhabits the northern border States of the Republic, the great plains bounded by the Sierra Madre and the Sierras of Coahuila; it is also found in Lower California. It is highly gregarious and sometimes ranges in herds numbering up to 35 individuals. It is noted for its inquisitiveness. This species is rapidly becoming extinct due to the fact that Mexican and American hunters pursue it without restraint, often chasing antelope in automobiles and engaging in veritable slaughter. The Department of Forests and Game and Fish is contemplating the establishment of reserves for antelope in the District of Altar, Sonora, for propagation of this species and has declared a strict closed season for it.

Peccary or Wild Pig.

Ranges over the whole Republic, more especially on mountains less than 10,000 feet high. Its flesh is eaten in some places; there is a great demand for hides for export to the United States, where they fetch good prices.

They are usually hunted with dogs.

Bears (*Ursus*).

Bears were not hunted to any great extent in former years, due to inaccessibility of their habitat. But improved facilities of com-

munication have brought about a great increase in bear shooting in late years. Only found in mountain ranges in northern Mexico.

Bighorn (*Ovis canadensis mexicana*).

Up to a few years ago was found on all mountain ranges in the northern part of the Republic, but now, due to relentless hunting, has sought refuge in the Sierras of Sonora, Chihuahua, and Lower California, where it climbs to the highest rocky peaks. This animal is coveted by hunters, but not all of them have either the funds or the physical endurance necessary for its pursuit and capture at their command. Despite this fact, and the further circumstance that shooting this sheep is absolutely prohibited, both American and Mexican hunters continue to pursue it, so much so that there is danger of its becoming extinct. A reservation for this animal, like that for the antelope, is contemplated in the Altar District of Sonora.

Tapir (*Tapirus americanus*).

Tapirs inhabit the tropical forests of southern Mexico, and, though not particularly abundant, they are by no means scarce. They are more plentiful in Quintana Roo and Campeche but are not much hunted, due to the dense tropical vegetation that covers those sections, that makes hunting difficult, and because of the danger from poisonous reptiles and insects, and the malarial nature of the land.

Rabbits (*Sylvilagus*) and Hares (*Lepus*).

Rabbits and hares are shot in great numbers by sportsmen and pot-hunters in the central portions of the country, but not so much elsewhere, and farmers in the northern portion of Mexico even look upon them as a plague, so much so that the Department of Forests and Game and Fish has decided to decree a closed season for coyotes in said States, as it is a well-known fact that these animals live chiefly on rabbit and hare meat.

Agouti (*Dasyprocta mexicana, Dasyprocta punctata*).

In Mexico exist these two species.

The Agouti ranges from the State of Vera Cruz to Quintana Roo. There are plenty of them and their flesh is much esteemed.

Jaguars, mountain lions or pumas, wild cats, ocelots, coyotes, foxes, badgers, and other predatory animals are pursued on account of the damage they do to cattle and domestic animals generally, and also because there is a good demand for their hides and skins in other countries.

Quails or Partridges (*Colinus virginianus*) (*Callipepla squamata* and other species).

These birds are much hunted both by sportsmen and pot-hunters, the latter capture them alive for export in large quantities to the United States. There are sections in Mexico's northern States where they abound. They are also exceedingly plentiful in Yucatan, but as in that section quail nest in sisal fields, the laborers on the plantations are their greatest enemies, and even destroy eggs and nests.

Wild turkey (*meleagris gallopavo*) and Ocellated turkey (*Agriocharis ocellata*).

Plentiful, both the first in northern and the second in southern Mexico, but entirely unknown in the central States. Mostly hunted

for its meat, which is delicious; there are a number of varieties of this bird.

Guan or Cajolite (*Penelope purpurascens*).

Mostly found in the hot country, and usually inhabits the same sections as wild turkeys.

Adorned with a plumed crest that stands up when danger threatens or when it is excited by anything. Its flesh is very much like that of the wild turkey. The head of the female is much like the head of the female wild turkey. Ranges in flocks of 10 to 20.

White-winged dove (*Melopelia asiatica*) and Mourning Dove or *Huilota* (*Zenaidura macroura*).

Some of these are migratory, others are not; both of them abound in Mexico and are therefore much sought after by sportsmen, especially around Mexico City and in the State of Morelos.

Upland plover or ganga (*Bartramia longicauda*).

This migratory fowl visits our land late in August, and in September. It is well known as a greedy little bird. As soon as the news of its arrival spreads, great bodies of hunters start out in pursuit. Last year but few of them came, and many hunters had to be satisfied with a single brace. Usually frequents the edges of corn fields, and fields of barley. Its flesh is most delicious.

Wilson Snipe or agachonas (*Capella delicata*).

This long-legged bird is not scarce in Mexico. Its favorite haunts are around the City of Mexico, especially Lake Texcoco. Although much hunted it does not seem likely that it will become extinct.

After the country people have harvested their crops, they flood the land, so as to prepare it for the next sowing, the water rotting the roots and any manure remaining, this breeding worms that are this snipe's favorite food. Shooting this game bird is a favorite sport in Mexico, and in winter numbers of sportsmen may be seen wading through the pools and marshes near Mexico City.

Lake Texcoco would be a suitable place for a Wilson snipe refuge.

Chachalaca (*Ortalis vetula* and *Ortalis wagleri*).

There are two principal species of this bird, differing in color, one a plain unattractive brown, being the commoner of the two, and the other rather more showy, as its plumage boasts different tints.

They both live in hot country forests and are treedwellers, preferring the more densely branching giants that line river banks. Their cry is very harsh-sounding, and occasionally as many as five will gather on a treetop crying all at once, as though trying each one to make more noise than the others. They abound in the woods and mountains of the State of Guerrero. The Indians are fond of their meat, but do not, in spite of this, hunt them very extensively, so that there does not seem to be any danger of their becoming extinct.

Chachalacas are easily tamed and thrive in captivity.

Curassow or faisan (*Crax globicera*).

The curassow, or hocco, is found in tropical forests on the seaward slopes along both coasts, but is never very plentiful. But little hunted due to the dense vegetation of its habitat and to its astuteness.

Little brown crane grulla (*Grus canadensis*).

This is one of many species of crane spread over all the continents. A winter inhabitant of some portions of the country and a bird of passage in others.

Mostly found in the northern States, that is to say Sonora, Lower California, Nuevo Leon, and Coahuila. Flies south in winter in search of warmth, when it frequents lakes in Michoacan, Morelos, Tlaxcala, Puebla, etc., and flies back north in the spring.

Swans (*Cygninae*), Geese (*Anserinae*), and Ducks (*Anatinae*).

Almost all these are migratory birds wintering in our country, much hunted by sportsmen in its central portions, and over lakes in the northern part of the Republic. This branch of sport will always be expensive due to the high cost of cartridges in Mexico.

Armadas or wholesale tier-shooting was forbidden 4 years ago by presidential decree, but is still occasionally practiced by evading official vigilance.

I sincerely trust that the information I have contributed may be of use for the purposes of this conference, and to bring my talk to a close, I wish to express to the honorable delegates, on behalf of my Government, our sincere appreciation of the opportunity afforded to us, through this conference, of cooperating in the good work of protecting wildlife and to express our feelings of cordial friendship and esteem for the governments and peoples of the United States of America and Canada. [Applause.]

Chairman SILCOX. We are very appreciative of your address, Mr. Zinser, on the situation of the wildlife in Mexico, and we appreciate your bringing to the attention of this conference the species in your country.

We have a representative from the Canadian Government, who will bring to us a message on "The administration of the wildlife of Canada." Mr. Hoyes Lloyd, who has been very active in this work for a great many years, is secretary of the advisory board on wildlife protection, of Canada. [Applause.]

REMARKS OF MR. HOYES LLOYD

Mr. HOYES LLOYD (Ottawa, Canada). Mr. Chairman, ladies and gentlemen: I had the pleasure of introducing our chairman last year, and he has to introduce me this year, you see, just from courtesy.

I don't think that it need be attributed to the fact that I presided over the American Game Conference last year that immediately afterwards it became defunct and dead, because it has just grown into this larger conference, which I am delighted to see.

In Canada the administration of wildlife in the various Provinces, aside from that in the national parks of Canada, is a Provincial responsibility. The ratification of the migratory bird treaty with the consent of the Provinces, and the passing of the Migratory Birds Convention Act in 1917, changed this slightly and brought the administration of migratory birds under the jurisdiction of the Dominion.

The migratory birds treaty was a culmination of several years' efforts effectively to protect migratory bird life in North America.

Many species of birds valued as a source of food or because they destroy insects which are injurious to forests and forage plants, as well as to agricultural crops, in both Canada and the United States, were in danger of depletion or extermination because of lack of adequate protection during the nesting season or while on their way to and from their breeding grounds, and it became necessary to adopt some uniform system of protection which would effectively prevent the indiscriminate slaughter of those migratory birds which are either useful to man or are harmless.

Briefly, the treaty provides for the extent of the open season which may be allowed in either country upon migratory game birds, prohibits hunting in the spring migration time when the birds are on their way to their nesting grounds, provides a closed time for a number of years on certain species which were considered in danger of extermination, and other lesser items, among which may be mentioned the shipment of protected birds, permission to kill birds which are causing damage, permission to utilize birds for scientific purposes, and for propagating purposes, and related matters.

Following the ratification of the treaty, the Parliament of Canada passed the Migratory Birds Convention Act in 1917, which places the administration of the treaty under the Minister of the Interior. Since the national parks branch of the Department of the Interior was already dealing with certain wildlife conservation matters, the administration of the treaty and the act was placed under that branch of the Department. Detailed regulations as provided for in the act were passed in 1918.

Canada, in spite of grave difficulties connected with such matters as the dependence of native populations in remote areas on wildlife for food, the difficulty of adequately policing the great territory involved in a matter of this kind, and other details, has kept faith with the principles of the treaty, and is making great progress in conservation.

The migratory bird treaty between the United States and Canada is an instrument of as great importance to the migratory birds of North America as was Magna Charta to the civilized people of the world. That great charter of June 1215 gave to the subjects it affected greater liberty than they had theretofore known; it meant to those subjects that justice should neither be sold, denied, nor delayed.

The migratory bird treaty has given to the birds of North America more justice, more consideration, and more protection than they enjoyed before the coming into effect of that treaty. From out of that treaty there has grown a wider sympathy toward the birds, the realization that they are held in partnership between two countries, and that they must be protected and cared for internationally if they are to survive. No international progress is possible without the cooperation of the Federal Governments concerned, and the treaty simplified the organization of Federal effort and Federal appropriation for migratory bird conservation in both the United States and Canada.

In Canada there has been close cooperation between the Dominion authorities and the game administrations of all the Provinces in all matters relating to the protection of migratory birds. Care has

been taken to consult the Provinces, year by year, and whenever minor changes in the regulations under the Dominion legislation appeared necessary to meet special circumstances arising in any Province, every possible effort consistent with conservation has been made to meet the Provincial views. No major difficulty has occurred between the Dominion and any Province arising from any misunderstanding with relation to the administration of the treaty or the Dominion laws based on it.

At present four chief Dominion migratory bird officers are charged with the administration of the Migratory Birds Convention Act in all the Provinces. One officer is in charge of this work in the maritime Provinces, one in Ontario and Quebec, one in the prairie Provinces, and one in British Columbia.

Each of these men is an authority on the bird life of his special territory. The duties of each of these officers are briefly: To know and report upon waterfowl breeding conditions in his district; to act as liaison officer and cooperate with posts of the Royal Canadian Mounted Police; to maintain contact with sportsmen's organizations; to establish personal contact with all cooperators, such as honorary game officers, bird banders, waterfowl observers; to cooperate with Provincial game authorities; to meet holders of permits to take birds for scientific purposes and be acquainted with the scientific work done by them; to make inspections of bird sanctuaries; and to carry on general public instruction by lectures and otherwise, as opportunity offers.

The Royal Canadian Mounted Police as part of its duties enforces Dominion laws for wildlife protection. This great police force was formed in 1873 after the acquisition of the western prairies by the Dominion had been consummated. Under agreement with the Provinces of Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island, the mounted police enforce Provincial laws, including enactments affecting game, fish, and wildlife, generally. The activity and prestige of the Royal Canadian Mounted Police has a far-reaching effect in establishing and maintaining respect for the law. This is particularly so in the remote areas of Canada where the vigilance of that body has been so effective in maintaining law and order.

By cooperation with the Provincial authorities concerned the following have been made honorary officers with authority under the Migratory Birds Convention Act, namely, the New Brunswick Provincial police; the game and fishery officers of Quebec, of Ontario, and of British Columbia. In other Provinces, a selected number of Provincial officers are given this authority by individual certificate.

The field officers of the Department of Fisheries and certain officers with outside duties in other branches of the Dominion Government Service are given authority of this nature as well.

As a general observation service in addition to these the Department has the benefit of the cooperation of over 600 honorary officers residing in various parts of Canada, who are specially interested in the conservation of bird life. Their involuntary services are of great value in connection with that work. Through information given by these officers and other observers the Department is kept informed of conservation needs in many of the remote parts of Canada.

The sanctuary idea in North America originated in Canada with the establishment in 1887 of Last Mountain Lake Sanctuary in what is now the Province of Saskatchewan, because it was recognized that the invasion of agriculture would replace much of the interesting and valuable waterfowl life of the prairies, unless such bird safety zones were established.

Following the migratory bird treaty a larger number of bird sanctuaries were established to protect breeding colonies of sea birds along the coast, to protect some of the very important nesting grounds for ducks in the southern part of the prairie Provinces and to extend protection to smaller areas of marshes and lakes, or in some instances of upland, where the private owners desire this special protection. The bird sanctuary idea is still a very active one. In all, 63 such sanctuaries have been established under the Migratory Birds Convention Act and of these, 18 were transferred to the prairie Provinces in 1930. A limited number of part-time bird protection officers are employed to protect certain sanctuary areas. Usually the guardian of a privately owned sanctuary is appointed an honorary game warden.

The outstanding work of Jack Miner in conducting a private sanctuary on his property at Kingsville, Ontario, has been recognized, both by the Migratory Bird Administration and directly by the Parliament of Canada.

In the national parks of Canada, which comprise an area of some 29,359 square miles, wildlife is administered by the Department of Interior, Ottawa. At the time of the establishment of some of the larger parks the area set aside had been almost depleted of wildlife by hunting and other causes. These sanctuaries, however, provided suitable protection for the remnant of the wild animals and their rehabilitation has been such that the surplus stock has spread to suitable habitat beyond park boundaries. The saving of stock of wild species in totally protected areas is a safeguard for the future.

Protection of wildlife in national parks falls primarily upon the park wardens, and, under direction of the park superintendent, it is their duty to be ever vigilant particularly in detection of poachers or of fire, the arch-enemy of wildlife. The place of residence of each warden is chosen because of its strategic value for fire fighting and game conservation. Their daily reports include details of animals they have seen.

Two main fish hatcheries are maintained in the national parks of Canada, one at Banff and one at Waterton Lakes, and a smaller hatchery at Jasper. These hatcheries provide fry for all parks, and as well supply fry for waters of the Province of Alberta at cost. To avoid the many errors which are known to have occurred everywhere while the science of pisciculture was being learned, through stocking water which would not support fish life, it is the policy of the parks administration, as far as possible, to have a biological survey of park waters before they are stocked. Such surveys are made by the Biological Board of Canada, which board conducts the marine biological work for the Department of Fisheries.

The Canadian Advisory Board on Wildlife Protection was constituted in 1916 for the purpose of coordinating the efforts of all agencies, Provincial, and Federal, concerned in the protection and use of wildlife, to advise in the administration of the Northwest Game Act, and in regard to legislation necessary under the treaty

with the United States of America for the protection of migratory birds.

The board, which is composed at present of 11 members representing the following departments of the Dominion Government: Agriculture (1); Fisheries (1); Indian Affairs (2); Interior (4); National Museum of Canada (2); Royal Canadian Mounted Police (1); is national, and, with regard to the Migratory Birds Convention Act, international in scope, and its advice on many questions of wildlife is sought by Provincial and Territorial authorities.

The advisory board is the focal point from which, at the request of the authorities concerned, have emanated in the 20 years of its existence many recommendations of policies which have since been adopted.

Falling as wildlife does under Provincial and Dominion jurisdiction, its administration requires joint action by the Provinces and Dominion if a correct national policy respecting this resource is to be followed. Probably the most important procedure for securing such a unification has been the calling of conferences of Provincial and Dominion officials who are concerned directly with the administration of wildlife matters. At such conferences difficulties have been debated and courses of action agreed upon and, in general, a unanimity of thought has been developed which has been for the good of Canada as a whole. It is considered very important that such conferences should be called at regular intervals because of the satisfactory results that they have attained in the past.

Generally speaking, all matters concerning wildlife in the Provinces, with the exception of migratory birds and wildlife in national parks, are solely under Provincial jurisdiction. It is realized that the wildlife problem of any one Province is the problem of other Provinces of the Dominion, and of the Dominion itself, and the close cooperation that exists among those concerned has a beneficial and far-reaching effect upon wildlife conservation in every quarter of the Dominion. [Applause.]

Chairman Silcox. There will be a broadcast by the National Broadcasting Co. of the next address.

BROADCAST

Announcer. The National Broadcasting Co. brings you the opening session of the North American Wildlife Conference called by the President of the United States.

These general sessions of the conference are being held in the United States Government Auditorium on Constitution Avenue here in Washington, D. C.

The principal speaker of today's session is Mr. Jay N. Darling, former Chief of the Bureau of Biological Survey. He will be introduced by the chairman of the conference, Mr. F. A. Silcox, Chief of the United States Forest Service. Mr. Silcox.

Chairman Silcox. It gives me a great deal of pleasure to introduce Jay N. Darling, former Chief of the Biological Survey, and a man who has been vitally and dynamically interested in this game problem over a great many years, and who usually doesn't have to talk, but uses his facile pen to tell his story with ink drawings. Mr. Darling. [Applause.]

Remarks of Mr. Jay N. Darling

Mr. Jay N. Darling. Mr. Chairman, representatives of our neighbor Governments, the Dominion of Canada and the Republic of Mexico, Mr. Secretary of Agriculture, and guests from abroad in this Continent: The program designates the subject on which I am to speak as "The Crisis."

When I look across this surprisingly large audience and the great breadth of interests what have come to this conference, instead of being a crisis it looks like a resurrection to me. [Applause.] It is gratifying to see the tremendous response which has followed the call of the President of the United States.

We have been welcomed in the name of the United States Government and the Conservation of Wildlife Resources. That the cause for which this conference is called is sorely in need of sober and thoughtful discussion is attested by the widespread eagerness with which the public has responded to the call. The Dominion of Canada and the Republic of Mexico have joined with the United States in pursuit of a common cause. That makes unanimous the official recognition that some constructive program of procedure must be devised which may rescue the wildlife population of this North American continent from extinction. We must restore it to the proportions requisite for the economic and social needs of this generation and the generations to come.

We, the inhabitants of this continent, are blessed with constitutional privileges which make the three Governments under which we live, without exception responsive to the expressed will of the people. If we do not voice our convictions we cannot expect response from our Government officials. Officials of these three Governments with whom rests the responsibility for custodianship of all the land, waters, and the welfare of the people, have recognized that great necessity. Will the constituents of these Governments accept the opportunity which is offered here to organize for coordinated and constructive action? Or will the interests of wildlife conservation continue as in the past to remain a spiritual presence without material force? Out of this meeting must come a definition of our common aims, free from the controversial differences inherent in group interests. A program comprehensive in scope must be devised on which our combined strength may unite. Ways and means of putting that program into effect must be considered, and to you, our international, regional, and State delegations must be committed the duty to carry the proposals here made, back to the communities from which you come for their consideration, amendment, and reconsideration a year from now.

In my judgment such a combination of fundamental principles for restoration of wildlife is entirely practical and physically attainable. Tentative outlines for all these objectives have been prepared and will be presented to this conference for your free and uninfluenced consideration on Wednesday. That day has been set aside for organization and discussion of the ways and means.

It is a nice thing to go a-fishing. It is pleasant to go into the fields with rod and gun, but there is something of deeper significance in this meeting, which has heretofore been entirely ignored. and it

is time to emphasize the fundamental economic factors which bear upon the relation of wildlife resources to our material prosperity.

Wealth will continue to exist on this continent only so long as the natural resources of our soil and water continue to yield up their riches. When these are gone, prosperity, standards of living and happiness among our people will vanish with them.

Devices of civilization, machines, money, and credit require a constant flow of raw materials from the land or they cease to function. To place all our bets on our industrial genius alone without covering the real source of wealth—natural resources—is to bet on the jockey and leave the horse entirely out of our calculations. Our carelessness and apathy toward this basic fact have been notorious on this continent, and among our rich endowment of natural resources no element has been so completely ignored and so heedlessly allowed to vanish as our wealth in the wildlife field. It has been the neglected stepchild of our family circle, forced to live on the crumbs from an opulent table, the servant of all, the responsibility of none, undernourished and exhausted by the universal demands placed upon it and subsisting on incidental charity.

We may clarify the proposition which lies before this conference by determining first what is meant by wildlife conservation, and its significance. We must, I believe, with common accord agree that whatever we may have been doing is not wildlife conservation, since we continue to have less instead of more. A great gap has existed somewhere in our continental mechanism for wildlife conservation through which has leaked a constant and increasing loss which has drained many of our species to the vanishing point and left an inadequate population of all the rest. If wildlife is an economic and social benefit, our first objective must be restoration. We have awakened too late to the needs of so-called conservation.

As I see it, there is no irreconcilable conflict between wildlife conservation and any branch of industrial interests. No one could successfully defend any project for wildlife conservation which would supplant a more beneficial use of land or water. The trouble in the past has been that the value of wildlife resources to the community and the continent as a whole has never even remotely entered into the economic bookkeeping of our national and industrial planning. Few are aware of the incalculable cash losses which have resulted to the people of this continent through this persistent oversight.

If anything further were required to emphasize this fact, it has been made tragically eloquent during these late years when in the time of great economic distress we suddenly discovered that the people of this continent could no longer fall back on those reserve resources of nature in our lakes, streams, and wooded hills, which had served to sustain us with profitable employment, food, and the necessities of life in time of need since the white man came to this continent; they are no longer there. Our polluted rivers and depleted lakes, once magnificent reservoirs of sustaining resources for international trade and continental consumption no longer yielded their vast bounty to stay the hunger of our people; the drained marshes and depleted forest lands had ceased to harbor the fur-bearing animals, once a major export commodity and a fountain of

riches. From the vast plains and wilderness areas of public domain came sickening cries for help where once nature had maintained a magnificent larder for man when other devices of urban civilization failed.

Nature's rich storehouse had been gutted. Man could no longer turn to it for the necessities of life when his self-generated hysteria threw the ingenious substitutes of money, banks, and industry out of gear. Nature's cushion was no longer there to break the fall when our artificial structures crashed. If nature's pantry had been wisely guarded the relief rolls would have been a fraction of their present astonishing magnitude.

The Connecticut River, which threads a highly developed industrial community, is foul with sludge and oily slime-waste from the factories and municipalities. It once harbored a bank-full run of salmon and all valuable aquatic life. The value of that annual salmon run in dollars and cents, food and employment balanced against the value of the river as a polluted sewer was never calculated. The tragedy of the situation is that we might still have had both the salmon and an equal industrial development. You know that on the Rhine River, where man has lived much longer than he has here, they still have a salmon run. One great advantage of Nature's factories over man's industries is that they do not close down in time of panic. Nature is oblivious to man's hysteria, goes blithely on producing, and only succumbs when we poison it with our own filth and waste.

There was a time when the sacrifice of one river or lake more or less meant nothing to this continent. We had so many of them. But when the natural productivity of all of them from one coast to another is sacrificed to artificial and often fictitious promotion schemes for small group profit, it is time for the public to take an inventory before it is too late.

We might not be so critical of industrial exploitation if it would give some evidence of weighing the value of wildlife resources against the profits of random industrial promotion. We might be reconciled to bidding farewell to the wildlife resources if we could be shown that by its elimination the public received a greater profit. We might tolerate the permanent destruction of a perennial crop of fish, clams, and unpolluted water supply in our streams for our cities by industrial waste if we could be sure the factories would run continuously and give in return equal benefits to the people. We might bow to the inevitable desert of our western plains if anyone could show us a continuing profit equal to the loss of the perpetual fruition of nature. We might even relish the propriety of drained marshes put under cultivation if the new crops could be shown to equal the annual cash revenue from muskrats or beaver. We might relinquish our primitive delight in the sustaining resources of our major streams and rejoice in badly financed power-dam projects in their place if the benefits to the public equaled the economic losses; but where both exploiters and public are the losers, with whom shall we rejoice? It is an indictment of our intelligent guardianship of our own welfare that up to this time we have never balanced the losses of natural wildlife resources in the equation of our economic and social welfare.

We can lay no claim to the title "conservationists" or even Yankee intelligence if in trading off our endowment of natural resources we make a bad bargain.

Overcapitalization of drainage, power, and irrigation projects has cost this country a pretty penny. We have cried to Heaven over the iniquities of the promoter who foisted the watered stock on the unsuspecting public, but we have remained apathetic and silent to the fact that probably the greatest loss of all was the destruction of natural resources in the area of development.

Putting out honey cups for the humming birds and suet for the wintering cardinals is a laudable and pleasant contribution; passing fervent resolutions protesting against the nonexistence of fish in our streams and birds on our uplands; buying a hunting license for a dollar and a half and subscribing to an outdoor magazine, are all desirable in their way, but they do not entitle anyone to a medal for distinguished service as a conservationist. [Applause.] We have been doing all these things for a generation and according ourselves honorary mention as good citizens.

Meanwhile the Hudson River, once visited annually by a prolific run of shad and sturgeon, has been transformed into a vacant biological desert. The Potomac shad run is almost gone. The Mississippi River, once bank full with the annual run of sturgeon going to their spawning grounds, sees no more shoals of sturgeon. The productivity of aquatic life of the entire Mississippi watercourse is approaching the zero point. And that includes everything, vegetation and all the environment for aquatic life.

The Great Lakes, once the world's greatest fresh-water reservoirs of what might have been a perpetual source of food and employment, have been wantonly depleted. The herring industry on Lake Erie is gone. It used to be an export product. Bull nets are dragging the depth of Lake Michigan and Lake Superior for the remnants of a once magnificent supply of white fish, there for your Great Lakes reservoirs. The salmon industry in our Pacific Coast States is being gradually driven to Alaska by the exploitation, industrial pollution and power plants on the coastal rivers which flow into the Pacific. The commercial fishing boats which have swept the waters of both coasts clean of profitable industry for the thousands of small independents who lived by these resources are now forced far beyond our borders to invade the coastal waters of our protesting neighbors.

Over 400,000,000 acres of land in Federal domain and forest lands are administered by this United States Government without any authorized jurisdiction over the wildlife resources and what is done in that direction is purely voluntary and the work of those men who are interested. In fact, wildlife has no legal standing under Federal law, and when Congress passes an act authorizing any agency of the Government to make such regulations as may be necessary to conserve valuable natural resources, wildlife species are not legally included. They are not legalistically natural resources, and that state of affairs has continued since Theodore Roosevelt's administration when Philander Knox, as United States Attorney General, rendered an opinion to that effect. Four hundred million acres and plus of public lands under Federal administration without legalized custody of wildlife, and you folks worry about your little fish pond and your

little river! These are fundamental facts of national irresponsibility, toward which we must turn our attention with a common aim. [Applause.]

The individual conscience without legalized authority vested in our administering officers is the only safeguard, and that is too often inadequate. Many major species of our most valuable big game animals hang by this narrow thread, or a much less dependable agency, on the voluntary care of private initiative. The one exception is the migratory waterfowl which are by virtue of an international treaty with Canada a Federal responsibility. Whatever may be said about the administration of that custodianship, we can all agree that there are not enough migratory waterfowl, songbirds, insectiverous or ornamental birds, and that one of the chief reasons for the deficiency is the useless destruction of nesting grounds and native habitat. [Applause.]

In the Senate and in the House of Representatives there are wildlife committees. They are good committees, I know; they have been of tremendous help, but the committee in the House of Representatives has no official standing, is without jurisdiction, and no bills, even those vitally concerned with wildlife, are ever officially referred to it. Their services are altogether voluntary. Something ought to be done about that!

Eighty percent of the States have State planning commissions working under the National Resources Planning Board. These most valuable adjuncts to our orderly use of nature's endowment are as a rule without any representatives or technical advisers who are even conscious of the wildlife requirements, nor are they informed on the biological consequences of their proposed projects.

Three States out of every four are without adequate technical staffs to administer the meager funds which are allocated for their use. Many of the State programs are intermittent and subject to complete reversals and new personnel with every change of political administration.

From 12 to 15 million dollars annually is spent under such chaotic supervision.

No textbooks exist for use in any of our educational systems covering the conservation subject—junior, intermediate, or senior. Technically trained men for the professional field of wildlife management are rare and accidental. There are no schools adequately prepared to furnish well-rounded courses in wildlife management, and not enough teachers to teach if the schools were available. During these late years of distress, with millions of money and millions of unemployed begging for useful projects contributory to our existence, wildlife restoration had little to offer in the way of a planned program for the first year and a half, and got little in return. Everyone else was awake except the wildlifers. The measure of their activity seems to end with high-sounding resolutions and individual effort.

Thirty years ago those advance agents of conservation, the forest interests, rediscovered the old axiom of Benjamin Franklin that forever taking out and never putting anything in soon empties the meal barrel. The Forestry Service was established and a program of replacement was inaugurated with magnificent and permanent results. The wildlifers are still unconscious of that axiomatic

B33145

A, Richardson's grouse, near Gros Ventre, Wyo. (Biological Survey photo.)

B4940M

B, Lean-to feeding station for sharp-tailed grouse in winter, in Wood County, Wis. (Wisconsin Conservation Department photo.)

B38371

A, Sora rail near Jackson, Wyo. (Biological Survey photo.)

B16444

B, Nest of rail eggs hidden in marsh grass near Marshy Lake, Ariz. (Biological Survey photo.)

phrase; we are late, but the history of the Forest Service furnishes us a good model for our activities. As forestry mustered support for its program, so must those interested in wildlife. As forestry adopted a policy of restoration rather than conservation, so must we.

We need a national program of restoration and conservation which shall be adopted as a policy of our national Government, which has none. Its responsibilities must be defined and the demarkation between Federal responsibility and State responsibility determined. If I were a minister I would say: "Oh my brothers, forget these factional differences between State and Federal jurisdiction—in neither Federal nor State wildlife activities have we any record to brag about." [Laughter and applause.] Cooperative devices between the States and the Federal Government now nonexistent should be inaugurated.

Let no one longer conceive the question of wildlife conservation to be limited to the interest of sportsmen and bird lovers. It is fundamentally economic in its major aspects, and a vital element in our existence, happiness, and prosperity. Any business with an annual turnover of 800 million in bad years and one billion dollars in good years can be financed if we will but try. Ignorance and neglect have been more responsible than any willful intent on the part of those people who have so briefly occupied this continent.

That needless and wasteful practices exist is too well known to be questioned. This conference will have been a failure if out of it does not come the nucleus of an organized program, continental in scope, which may first provide a means of disseminating an intelligent understanding of the problems, and, second, set up a mechanism which will force adequate recognition of wildlife interests and require our governmental agencies to set an extra place at the family table for wildlife conservation.

The question arises in the minds of everyone, "What can we do about it?" One or two things I can suggest which we should not do about it. We can proceed more speedily toward our goal if we will avoid these controversial questions and quarrels which have disrupted our conservation activities in the past. These factional wars and lack of unity among us have been chiefly responsible for the present calamitous condition in our wildlife resources.

There are common aims to which the most widely separated factional groups may subscribe. No. 1 is that we haven't enough wildlife. Will anybody quarrel with that statement? No. 2 is that restoration of wildlife is synonymous with restoration of environments in which it lives. And no. 3 is that if we are to accomplish the desired objectives, which are all-important nationally and to each isolated subdivision, we must unite our forces. When you restore environment for wildlife you accomplish restoration of all the other important conservation elements; water conservation, soil conservation, forest and vegetation conservation, and every other type of continental resources. Environmental restoration, then, is our problem. We shall not need incubators to hatch wildlife if we give nature a chance.

There is a general tendency to blame public servants and Government officials for all our failures in the realm of wildlife conservation activities. I would like to file a general denial to that wholly

erroneous charge. I have known, intimately, many Government executives, and not one of them would choose willingly to despoil his community or his country, and not one that would not rather please his constituents than incur their displeasure. The crimes that have been committed against our wildlife resources cannot justly be laid at the door of our elected officials when we ourselves have never voiced our convictions or made concrete demands backed by impressive numbers. [Applause.] After all, this is a democracy, and our public officials are responsive, as they should be, to the voice of the public expressed at the polls. To be sure, public officials, State legislators, Congressmen, and county supervisors are so universally conspicuous by their absence from conservation conventions and group meetings that it can be generally stated without serious inaccuracy that they never attend, though I am glad to see some of them here today. It so rarely happens that it deserves special mention. I think I have made 207 speeches in the last 2½ years, and very rarely do I ever see a State or National official of the Government attending a wildlife conservation meeting. You never have to include them in your addresses. Any why? [Laughter.] You'd better not laugh at them. It's your fault. The seven and a half million wildlife enthusiasts are not recognized as a political factor. As our esteemed collaborator Thomas H. Beck has pungently remarked: "Ducks don't vote," and I might add that neither do conservationists, nor do they use their influence on the public officials after election.

Our scattered and desultory organizations, 36,000 of them in this country, have never, to my certain knowledge, influenced so much as the election of a dog catcher, excepting in Alabama where they have a popularly elected official, and he is a good one.

Thirty-six thousand clubs, leagues, and associations whose chief objective is wildlife conservation or some aspect of it, 78,000 separate organizations in the Federated Women's Clubs, which has a national committee devoted to conservation, 25,000 garden clubs, and an estimated seven and a half million individuals who by their annual purchase of license fees indicate their interest in wildlife, and yet with all this potential voting strength the wildlife conservationists all together exert less political influence on our governments, both State and National, than the Barrel Rollers' Union in Pumpkin Center. The local labor unions, whether they like each other or not, join together for their common interests in a local trades and labor assembly. Representatives of the local unions are sent to the State federation, and the State federations in turn are represented in the national American Federation of Labor, and from Pumpkin Center to Washington, D. C., no commissioner of labor, local, State, or Federal, and no legislative measure bearing on the interests of the workers is undertaken without consultation with the representatives of organized labor.

But the forces of wildlife conservation are as helpless and ineffective as the Ethiopian Army, divided into a thousand tribal units, speaking different languages, armed with spears and arrows, brave but unorganized. Their courage and patriotism is unquestioned; they beat their war drums and exhaust their emotions in fierce war dances, but when they meet the enemy, the organized Roman legions of Mussolini, their casualties are in the general ratio of 1,000 to 1. How very like the battle of resolutions waged by the scattered unco-

ordinated tribal groups of bird lovers, sportsmen, Audubon societies, leagues, and game protective associations. If we will ever combine our mass strength for the common aims of more wildlife and restoration of environment, no public official will fail to seek to annex this mass voting strength in his support. You will no longer be going to them as suppliants—they will be coming to you.

George Washington and his barefooted compatriots once fought for the privilege of running these United States according to the wishes of its inhabitants. That historic struggle provided us with a set of tools to keep our governmental machinery in working order. The wildlife conservationists have neglected their duty. George Washington did a great many things for us for which we should be profoundly grateful, but he did not give us a perpetual-motion machine which would run forever without any attention, and so far as the wildlife conservationists are concerned they have never lifted the hood of their political machine or had their hands on the monkey wrench.

Public officials are tools of the people of this republic. If you do not use them someone else will, and the job may not be done to suit you. And that goes for everything else in connection with Government as well as wildlife interests. Don't blame your public officials for your own apathy. The political voices of the conservationists have been as silent as the tomb.

I can name you 1 State in which 43,000 duck stamps alone are sold and the fishermen outnumber the shooters 3 to 1. Combined, they outnumber 1,000 to 1 the supporters of any political job hunter. Is there anyone who believes that the Governor of that State would neglect the support of 43,000 voters in order to please the paltry few who petitioned for the appointment of a purely political game commissioner?

After all, one of the jobs of the public official is to serve the people who elect him. Conservationists never helped elect anybody or as conservationists defeated anyone, or raised a protest except in resolutions. What is more, they never use their numerical strength after election. The problem resolves itself, therefore, into one of federation of the group interests to bring to bear their voting strength upon the men who are willing to serve when the demand is made impressive by numbers.

I have seen a memorandum from the United States Secretary of the Treasury written in response to a request for an opinion as to how a national wildlife restoration program could be financed. The opinion was clear and convincing that the financial support of such a program must come from a public demand through Congress. Need you have any further proof of the necessity for uniting the various factions interested in wildlife in a federation for the common aims over which there can be no controversy?

Wednesday will be devoted to the discussion of such a federation, here in this room. May I add that any federation which unites to bring the mass forces to bear upon public officials will fail if it does not also provide those same mass forces with information to insure intelligence before pressure.

Such governmental agencies as exist for wildlife conservation need your support. I can speak from experience. I have spent 2 years in an earnest effort to discover ways and means to bring wildlife

restoration up to a level equal to its economic and social importance. I received ample sympathy, for which I was grateful, but very inadequate financial support. The pressure from other sources for other uses for emergency funds was so much greater than anything I could muster in support of wildlife projects that wildlife always went to the well and came back with an empty pitcher.

Did you ever stand in a long line in front of a ticket window and see the manager of the house slip in ahead of everyone else with a group of favored patrons and say: "12 tickets, front row, center for some friends of mine; please," and by the time you got there all the seats were gone? That's what happens when wildlife projects go up for consideration. We don't know the manager. Wildlife interests have never even expressed themselves for an introduction to the powers that be.

Do not expect anyone else is going to do your job for you. If you want coordination it is up to you, and the President of the United States has called this meeting with a realization of that fact. If you want an annual conference of wildlife interests, that is also your privilege. No one is going to sponsor this thing and work their heads off any more unless you folks at this time evolve something out of this gathering which will have a semblance of organized unity and be continuous. People are tired of supporting your projects by individual efforts. I know, I am one of them. I have searched the universe for a messiah who could wave a magic wand and accomplish your aims for you without any effort on your behalf. I couldn't find any. There is an old American custom to let the people rule; and if the political job hunters are able to outnumber you folks in any county, district, or national issue, it is your fault and your responsibility and not because you lack number. I bespeak for you folks, and to you folks, a great earnestness in this conference. The wildlife problems are in your hands. No one is going to put a restraining hand on your free expression of opinion or anything you may choose to do. If there is any attempt by any single interest to dominate this conference and I find it out I will try to stop it, and Mr. Silcox, the chairman here, is in the same frame of mind. I charge you therefore with a great responsibility, to direct your efforts to a constructive program and to organize permanently for its accomplishment.

Thank you very much. [Applause.]

Chairman SILCOX. I compliment "Ding" Darling on his speech to this audience calling for unity of action. I have seen so many of these gatherings come together, pass resolutions, and simply disperse. "Ding" was at his best today in arousing you to the necessity for forming a centralized organization of some sort which can become articulate on this whole problem. He is going to be chairman on Wednesday of a meeting which has for its sole purpose the devising of a mechanism which will make this program continuous.

Before we close this afternoon I will ask Mr. Seth Gordon to make some announcements.

Mr. SETH GORDON. The first is probably of most vital importance, having to do with State caucuses. Each State is requested to caucus the representatives of all organizations and individuals in attendance between now and Wednesday morning for the purpose of selecting a committee of five from each State to give preliminary consideration

to organization questions. An effort should be made to make these committees completely representative of all groups within the State in attendance. The preliminary discussions which will be undertaken by these committees will be later referred for open discussion to the floor of the conference. The committee of five from each State in turn should select a chairman who may act as contact man and general spokesman for the committee from each State.

* * * Further announcements concerning registration, banquet, and exhibits * * *

CHAIRMAN SILCOX. May I again urge that you be present on time at these sessions, and with nothing further on the program for this afternoon, let me again express my appreciation for your attendance.

(The meeting adjourned at 4:05 p. m.)

TUESDAY MORNING SESSION, FEBRUARY 4, 1936

The conference was called to order at 9:10 o'clock by Mr. Jay N. Darling.

Chairman DARLING. I always thought that wildlife people and outdoor people rose early in the morning and got an early start. I really think it is the weather.

I am going to ask Mr. Hoyes Lloyd to take charge of the meeting. He needs no introduction to this audience.

(Mr. Hoyes Lloyd, Ottawa, Canada, took the chair.)

Chairman LLOYD. Ladies and gentlemen—I don't know whether it means that you need a referee when you call in an outsider for chairman, I hope it doesn't. Sometimes those things make one suspicious. I have seen these conferences for many years, but I have never seen one of the size of the present one and I think it speaks great things for the future.

The opening remarks for our morning session are by Senator Key Pittman, acting chairman of the Senate Special Committee on Conservation of Wildlife Resources.

We, from outside, the Canadian delegation, are interested to see that you have a Senate Committee on Wildlife Resources. We have read of all it has done and we are always glad to meet the members of the committee.

Senator Pittman knows Canada, knows weather conditions like we are having this morning very well, and so he and I were here right on time. Senator Pittman.

REMARKS OF HON. KEY PITTMAN

Hon. KEY PITTMAN. Mr. Chairman, members of the Federation for the Restoration of Wildlife: I am very happy to be with you here today. I feel very grateful to providence that I was able to get here considering the time it took me.

You know, I feel that this unusual weather that we have here was really put on for the benefit of the Canadians. They have been down here on occasions when we had our delightful Washington weather, when the temperature was around 60 and the sun was shining brightly, and we recognized at that time that they were suffering from a kind of ennui. They didn't have the pep that the chairman has this morning.

Then again, those of us who frequently visit the wild West and California, particularly Los Angeles, during some torrential rains, realize that those people out there desire unusual weather. In fact, I have never been in California but that I have discovered this wonderfully unusual weather they have out there. I don't know whether there are any Californians here this morning or not. I realize the great difficulty of attending this conference this morning. I live only probably 3 miles from here and it took me nearly a half hour to reach this hall.

As I came along I found automobiles that had no chains that slid against the side of the road, large busses parked back to back and examining the engineering feature you couldn't see how they could be removed until the thaw without destroying them entirely, and every taxicab in town that was not in the ditch was in service. I am disappointed, of course, that more of us could not possibly reach the hall this morning.

I think in the 8 minutes allotted to me by Mr. Darling—I believe he arranged my time—at least realizing that I had 8 minutes time I suspected Mr. Darling of having arranged the program this morning—I am to discuss, I believe, the economic and social aspects of the restoration of wildlife.

In writing to Mr. Silcox, the general chairman, I begged off on discussing the economic features of this matter because I realize there are statisticians on the subject in the Department who are much better qualified to discuss that particular phase of it than I am.

However, I feel that to a certain extent I may discuss the social benefits to be derived from the restoration of wildlife. I have from my earliest youth been a hunter and a fisherman. I have had the opportunity in various countries, in the Arctic, the Tropics, and the East and West, to enjoy that which I consider the highest of sports. In my opinion, there is no sport, there is no exercise, there is no exhilaration or health-giving quality both for the mind and body equal to sports in connection with nature. Possibly I take that view of it because I am such a rotten golf player. Notwithstanding that, I look back on the history of this country and I find that the great statesmen that created this Government, the great pioneers who forced their way through the wilderness and over the mountains fighting Indians, lived with nature, lived on nature, and that it built up for them great bodies, calm, courageous minds, an understanding that today we frequently do not find in the turmoil and bustle and necessities of our great cities.

Believing in this social effect as I do, and as I have been thrown more actively in public life during the last 23 years and have been denied quite frequently those great pleasures and exhilarations, I have rather longed to see them perpetuated for those who are to come on.

I thoroughly realize that there are various schools of thought in the restoration and enjoyment of wildlife.

Fortunately in this great convention that is now meeting in Washington there will be no detailed discussions as to the bag limit, the feeding of ducks, or whether it is advantageous to wildlife to prohibit the destroying of predators. Those are subjects that we all enjoy hearing discussed but not now.

Since I have been a member of the Special Committee on Wildlife of the United States Senate, we have had the pleasure of having representatives of the game commissions of the various States, representatives of our great game clubs and conservation societies, appear before that committee and give their testimony with respect to their theory of the restoration and preservation of wildlife. It is extremely interesting. As I say, it goes from a control of the shooting of wildlife to the actual prohibition of any extermination of wildlife.

I do not take it that this great convention which I believe is the largest which has ever been gathered on such an occasion has in mind a discussion of these details or these theories of conservation or restoration; they have gathered together behind one cause upon which they all fundamentally agree, and that is the restoration of the wildlife of this continent.

It is a magnificent group of nature sportsmen; it is composed of some of the finest men and women that this continent has produced, who have come these great distances to meet here, unselfishly, with high ideals, to discuss a plan for the restoration of the wildlife of this continent which has, as I say, built up the manhood and the womanhood, the morals, the character, of a great people, which has given them courage and initiative to be at home in the wilds with nature. And therefore I contend that no greater convention has ever met on this subject or possibly ever will because there are brought together these various schools of thought, laying aside temporarily their particular plans for restoration and protection of wildlife, intent solely on acting together throughout this continent with a single purpose of molding the sentiment of our people back of legislation, back of administration, so that it may be a success.

If I may revert for a few moments as a legislator, I say to you that we of the legislative branch of this Government feel the necessity for support, moral and sentimental support, of our constituents in every matter upon which we must legislate. I realize that sometimes, my friends, we are charged with not being statesmen, but yielding to every whim of our constituents; there are times when we of the legislative branch of the Government feel as if we have had greater opportunities possibly than those at home to see all sides of the question, and we go back and tell them what we know and what we think. We try to win their support, and yet I may say to you, on the other hand, that this is a representative Government. We are elected by our constituents for the purpose of advocating the policies that they believe in. When the time comes that we cannot advocate those principles it is our duty to resign. We have no right to be their agents and their representatives and yet act contrary to their wishes.

Therefore, I think it is of tremendous importance that those great nature sportsmen and sportswomen of this country who have studied these questions, who understand them, who understand the tremendous importance of restoring the wildlife resources of this country, shall go back to their own people and teach them the economic, the social, and the moral advantages of this great movement; and when they become as convinced as you are, when they become as interested as you are, when they are imbued with the same enthusiasm,

then the slaughtering of wildlife out of season, poaching, slaughtering by night without limit, total disregard for these laws will cease to exist, and when they cease to exist (and I believe that it can only be brought about through the support of those who know it like you) when it is brought about, then it will be easy for us in the legislative branches of both Federal and State Governments to enact reasonable and proper laws looking to the restoration and preservation of wildlife, and the administrators of your Government will find their task much easier than it is now; they will find that in the enforcement of their duties they will not meet powerful opposition, public criticism in papers, but they will be commended for having carried out the laws of their country and their States.

Just briefly I wish to say this to you, that since the establishment of the special committee on wildlife of the United States Senate, more legislation has been accomplished for the restoration and protection of our wildlife resources than in many years before, at least in the 23 years that I have been in the United States Senate.

I will not go into the detail of that legislation because it is familiar to the members of this convention, but in passing I wish to say that credit is due so largely to those splendid conservationists and sportsmen like Senator Fred Walcott, who has retired from the United States Senate; Senator Harry Hawes, who has also retired from the United States Senate; Senator Norbeck, who is now in the Senate; Senator McNary, who is now the leader of the minority in the Senate; and also to the secretary of that committee who has been untiring in his labors—I speak of my friend Carl Shoemaker.

And after we had organized this committee in the Senate, because there seemed to be no other committee interested in the subject, after about 2 years some of our nature sportsmen in the House of Representatives saw the wisdom of having a special committee of that kind, and so they organized a committee in the House of Representatives, and it is doing and has done magnificent work; it is cooperating fully with the special committee of the United States Senate.

I wish to say to you that not only must there be cooperation between the members of this convention and the citizens and representatives within their community, but there must be cooperation between the members of this great convention and their legislators, whether in national or State administration, and also with their administrators, both national and State and local. When that is accomplished I think it is entirely reasonable that the great work that has been going on for 45 years toward the restoration of wildlife will be consummated. Why, we have every reason to be encouraged. We notice in the first place that a treaty was entered into between Canada and the United States for the protection and preservation of migratory birds, and that has accomplished much; that has accomplished about all it can accomplish. Now, the burden falls upon us to do our part outside and beyond that protection. It can be done. I am sure it will be done. Under Mr. Darling, who sits here, we have acquired hundreds of thousands of acres of land throughout the United States and made out of it a sanctuary for birds, a place where they will live and feed and be safe from destruction.

The amount of land which has been acquired in the last 2 or 3 years is enormous. It furnishes the migratory birds nesting and feeding places and sanctuary all the way from the Canadian line clear to the Gulf of Mexico. Therefore I am happy to say that our great neighbors on the north here today will tell us of their thoughts and what they are doing, will confer with us on what we are doing and what we should do, and I am happy to say that we have representatives here today from our great neighbors of the South who show every spirit of cooperation and who, I believe, will help consummate this great thing.

I think that we ought to be happy; I think that this great convention will bring about more enthusiasm than anything that has ever happened in this country.

I thank you. [Applause.]

Chairman LLOYD. Senator Pittman has given us a very inspiring message. He has told you, speaking from the heart as he has spoken, of the difficulties and of the problems that are involved in this great continental problem. I am sure you will realize that he has set a task for everyone and that you will take his message to heart as I know I shall, and try to meet the responsibilities so far as I can, and I hope that all of you will do the same individually to meet the responsibilities of carrying that message, because if the people of this continent realize the import of it there will be very little difficulty in the problem in which we are all involved.

Our next speaker is going to talk to us on the general topic about Why Concern Ourselves About Wildlife? and under that topic, the economic importance of the subject.

It is nothing against wildlife conservation that it has an economic aspect. We must have the wherewithal to conserve wildlife. It is a fine thing that many of us believe in conserving it for its own sake alone, but if in so conserving it some of the esthetic and some of the sport values may be made to pay their way, if wildlife itself may be made to pay its way, I see that that is no real objection.

Our speaker is Roswell P. Rosengren, vice president of the United States Junior Chamber of Commerce.

In the great organization of all conservation interests under way, the Junior Chamber of Commerce have had an organization already prepared and have been of very great assistance. I am going to call on Mr. Rosengren. [Applause.]

REMARKS OF ROSWELL P. ROSENGREN

Mr. ROSWELL P. ROSENGREN. Mr. Chairman, ladies and gentlemen: There are a few things I recognize now. A late train and icy streets and a trip to the Mayflower and a walk around the slithering pavement around here has taught me a number of things. A few remarks that Senator Key Pittman made have convinced me of one other thing. When so astute a gentleman as he refuses to be heard on the economic side of this question, I can see why it was turned over to the United States Junior Chamber of Commerce and Mr. Darling's gang of kids as he so lovingly has called us, and as we know him, and we don't consider him out of our age range although it ends at the age of 36.

Now, ladies and gentlemen, due to the fact that President Allen Whitfield, of Des Moines, Iowa, can't be here to talk before this meeting, you are going to have to hear from a second-hand speaker. The economic phases of this subject from the point of view of the United States Junior Chamber of Commerce you will have to hear from a mere vice president.

A word about the organization itself. Organized in 1920 in the city of St. Louis, the Junior Chamber of Commerce is a national body of 50,000 young men affiliated nationally from and representing every section of this country in 300 cities and other municipalities. It is the only voluntary young men's association of its kind in this country—nonpolitical, nonsectarian, nonanything, except what I believe to be one of the finest instrumentalities for the accomplishment of the greatest good for the greatest number that this country has yet known; with headquarters recently established in the city of its birth, where last we met Mr. Darling; it is a national clearing house for methods of operation of local junior chambers of commerce, such as the Junior Board of Commerce in Washington, D. C., and the New York State Junior Chamber of Commerce in the State from which I come.

It publishes a magazine which is called Young Executives. Some of you may have read the conservation article and have seen Mr. Darling's cartoon in the January number. It embraces in its age limit 40 percent of the voting population of the United States, and much of that percentage of the population is already directly or indirectly affected by the policies of the United States Junior Chamber of Commerce.

Now, an examination of the history, growth, and achievements of this organization convinces one, as I said before, that it is potentially at least the greatest instrumentality for the accomplishment of the greatest good for the greatest number, and it is rapidly changing those potentialities into actualities and realities. The very fact that it was selected as the spearhead for the county and State organizations of this federation is an argument eloquent toward that end.

To those of you who have been steeped in this subject let me say at the outset that while there are such men in our organization as C. E. Clark, Jr., of Jacksonville, Fla., and Dr. William T. King of the University of Minnesota, chairman and vice chairman, respectively, of our committee on conservation of natural resources who are familiar with this subject, we as a group don't claim that we are conservation experts. In fact, we knew little about this subject until Mr. Darling presented it to our board of directors in Omaha, Nebr., last October. At that time we became instantly and vitally interested in the subject.

Plans continued, were developed under the capable leadership of President Whitfield and in conference with Mr. Darling, and when we had our second board of directors' meeting in connection with our conservation committee the first of last month, to which we invited the presidents of all our State organizations, the thing was ready to go, and literally from that meeting our men went out to every corner of this country and the work is under way.

We are to discuss the economic importance of wildlife, and a representative of the junior chamber can but give you our point of view of this problem in a simple, logical statement.

We are convinced that the present situation is intolerable. Wildlife destruction and the lack of organization to prevent it in spite of the army interested but disorganized, is an abomination. There is an immediate need for all of us first to be educated by those who are experts in the various phases of all the fields of this great subject. Then those interested must somehow have the facts and the "somehow" that reaches them must be facts and not guesses. Once we have the facts we should be organized by counties and States, to the end that effective legislation may be first devised, then the pressure brought so it will be enacted, and then after that that the actual putting into effect of that legislation be put into the hands of those who by their peculiar qualifications are fitted actually to administer them. Uninformed officials appointed in political exigencies only can unintentionally defeat the entire purpose and all the work that precedes the finest legislation action that is possible.

Now, ladies and gentlemen, there is nothing quite so dull as the statistics which Senator Pittman suggested were available here in Washington, thrown in endless confusion at an audience, but we cannot avoid certain glaring facts with respect to this subject. So if you will, for the sake of accuracy, permit me to refer to the statistics that have been gathered by the United States Junior Chamber of Commerce conservation committee; they will be brief and in percentages, and in relationships and not figures. Let me state these five simple things:

1. Nearly three-quarters of a billion—

and I quote—

of original forest land is now denuded, resulting in barren waste, tax delinquency, erosion beyond redemption, recurrent floods, game range reduction, impairment of fishing waters, and community pauperization.

2. One hundred million acres of original wildlife breeding grounds are drained, with the attendant decrease in waterfowl, fur bearers, and fish life, further floods, droughts and dust storms ensue, and more than half the drained land is agriculturally worthless.

3. Eighty-five percent of our lakes and streams are polluted by industries and municipalities. This increases our annual pure-water bill by $1,000,000,000.

That is a lot of money even when we are used to collecting and spending a lot of money, or at least spending it.

It increases our taxes, it impairs property values, destroys fish and other waterfowl supply, endangers shipping, increasing its cost, and—

as you have already heard—

ruins recreation.

4. The less than 2,000,000 acres of remaining public domain lands are overgrazed and denuded, more floods, more droughts, more dust storms, irrigation reservoirs ruined by silting, wildlife ranges usurped and destroyed.

5. Eight wildlife species are now extinct, others are reduced to the verge of extinction, waterfowl supply is a fraction of its former abundance, valuable fur bearers are endangered, the food and game fish supply is seriously impaired.

What is the result? Hunting and fishing seasons are progressively restricted. Bags and creels are constantly reduced, the public's right to enjoy

that contact with wildlife which it has had prevents continuingly fewer opportunities, and the annual economic return—

and that is what we are talking about here and now—

from fish, game, and other wildlife dwindles rapidly toward the vanishing point.

Now, do these facts need a professor of economics for interpretation into dollars and cents cut from every business, industry, and profession in the country? One of the most significant statements that I heard in connection with this entire thing—and I trust it is sufficiently general, Mr. Darling, so that I am not violating a confidence if it was a confidence told to our board of directors—was the fact that industrialists and businessmen, not directly related at all to this subject of conservation, traveled thousands of miles in great proportion to those invited to have dinner in Washington with Mr. Darling and his associates. Now, Mr. Darling is a charming fellow, and I have no doubt from past experience that dinner in this town was a good dinner, but I don't believe they came for the dinner, because I know they have good dinners in some of the cities from which they came. They came for one purpose, because they recognized the tremendous importance economically, basically, to all business and industry of the preservation of our wildlife so rapidly being destroyed.

Let us look at this story in simple economy. The power, importance, and wealth of the United States has been built on a ruthless robbing of nature's bounty. Whether we like it or not, the facts that we have just reviewed speak eloquently in that. Fortunately we are alarmed, we are too late to eradicate some evils, but we are in time to stem the tide and to build back.

Take a look at our forests. What do we face with complete woodland destruction in the offing? How can we avoid these consequences?

A Buffalo acquaintance of mine, with 20 years' conservation experience back of him, gave me a small-scale and very illuminating example that we can apply universally. He owns a place in the country at a place that is very well named, Eden. Because of his conservation experience he went out scientifically to preserve his woodlands. In one year, when we had a so-called dry summer, he, knowing that the average good sized tree holds 230 gallons of water, and preserving these woodlands, had water through September when the general rule was torrential spring floods and complete summer drought, even in Eden.

Now the river that runs into the Niagara River in the community in which I live, the Buffalo River, costs us $75,000 a year to dredge for shipping. That is an economic factor and we pay it every year and the reason we pay it is because a lot of others like my ancestors who have lived there for a hundred years cut down the trees ruthlessly prior to that time.

Pollution and carelessness have destroyed absolutely the fish supply in the Niagara River and the adjoining Lake Erie and Lake Ontario of the Great Lakes system, and now at last, compelled by public-health interests to do so, we are building a sewage disposal plant in Buffalo that we should have had for other purposes years ago. There is no reason why this conference with its power cannot force industry and municipalities alike to figuratively burn their own

smoke, eliminate pollution that we may once more have cheap food at hand for our table, and that we may again have the healthful recreation that God originally placed at our own door steps. Completely destroy the woodland and you destroy the fur bearers. They must seek the woodland for protection, for food, and for cover.

The economic value? This industry alone runs into $13,000,000 in New York State, just one little State, annually.

Man, however, is not the only agent of destruction. Nature does enough without our help. Take the recent chestnut-tree blight, which among other things, looking at it from an economic point of view, by this uncontrollable bacterial infection affected 300,000,000 invested in plants using tannic acid in industry. At present a similar scourge is spelling death to the elm. If we don't replant, a good many, particularly of our northern cities, are going to lose absolutely 85 percent of their shade trees. You know more the significance of that than I do.

The only alternative to preservation and maintenance of forests is a destruction beyond our comprehension. The Civilian Conservation Corps, putting into actuality an old conservation scheme, is a splendid step in the right direction in our opinion. It should be continued permanently in some form, preferably removed from politics. Besides giving direct immediate employment, upon which compulsion its organization was predicated, money thus spent is well spent; it goes to restore the capital resources of the country; it increases the capital value of the United States, and indirectly as well as directly puts people back to work in gainful occupations. Reemployment is vital, and it is useless and superfluous to say to you how business and industry, as well as those ousted by the so-called machine age and other causes, would appreciate such a return.

If you will forgive another local reference by way of illustration, New York State has a reforestation plan which if carried out will give it enough lumber in New York State for the use of its people. Do you realize the significance of that statement? It means among other things, looking at the budget of the ordinary family, that we are going to be able to buy cheap furniture for our houses and we are not going to have to pay freight rates from 3 to 3,500 miles away.

At the risk of insulting our collective intelligence, let us be reminded that a people at work is a happy people. We are all too familiar with the reverse side of that picture. A people at work is a people tending toward law and order. Confidence is simultaneously restored and preserved. Such confidence, happiness, and work is based upon business recovery in direct proportion. We have it in our hands to contribute at least to that recovery. It, business health, big business and little business, industry and commerce in all its phases, is the basis of that "high standard of living" which we are trying in devious ways to have return.

May I borrow an illustration from a recent address of President J. S. Thomas, of Clarkson College, which I heard and discussed with Dr. Thomas afterward, when he said:

> If you will study the history of the decline of the Greek Golden Age in direct proportion to the decline of Greek trade, and if you will read the Rise and Fall of the Roman Empire, not entirely as Gibbon wrote it, but with the rise and fall of Roman commerce, you will have a picture that will illustrate what we are talking about.

We know that exchange and that business health is the basis upon which all the arts and the sciences and the social side of this and the esthetic side of this subject are built, and it is an important fact. We believe the economic importance of wildlife is of basic importance and that action along these lines should be commensurate with that importance.

We can afford to pause for one moment to draw the self-evident conclusion that the 13,000,000 sportsmen who buy hunting and fishing licenses annually, and that is enough to decide a national election, in spending three-quarters of a billion annually in pursuit of their favorite pastimes, present so colossal an economic factor that we do not dare look beyond the veil of its removal.

"What can we do?" you ask. Six hundred years before the birth of Christ, Aesop gave you the answer in the fable of The Father and His Sons. You remember how he took the bundle of sticks and handed it from one to another of his quarreling offspring. You remember how it was impossible for them to break the faggots, but how easily they broke each stick when it was separated from the others, and you will recall at the conclusion of the tests what the father said. Now listen: "My sons" (or those interested in an isolated way in conservation), "if you are of one mind and unite to assist each other you will be as this faggot, uninjured by all the attempts of your enemies", or to paraphrase it, "able with power to go ahead against those who stand in your way, but if you are divided among yourselves you will be broken as easily as these sticks."

Are not the myriad conservation organizations in the position of the sons today? Is not our problem of much greater compelling force than that of the sons, and are we thus not constrained to seek the strength of unity? Cannot the minor differences which exist certainly in New York State be subordinated to the fundamental necessity of the restoration of wildlife? Can we not all unite to this end that our own lives may be more abundant? We are assured that there will be no "brass hats." I have seen none so far. Cooperating units will be independent to govern their own policies. The proposed federation belongs to all, and each will contribute in the shaping of its policies and help in the carrying out of those determined policies. Under our system of government, unfortunately, but we know it is true, only the compelling force of millions of united voters can accomplish the devising, enactment, and enforcement of laws to meet our determined needs.

As for the Junior Chamber of Commerce of the United States we seek but to learn and to help. We have no ax to grind, and we want neither office nor influence, except as the influence of this rapidly growing body can be used for the best interests of the greatest number. We are interested in the correlation of governmental agencies so that one doesn't appropriate $1,000,000 to flood a place for a swamp as a preserve for wildlife and then turn around and with another million dollars drain it to get rid of mosquitoes regardless of the fact that there isn't anyone within 40 miles to be stung except the taxpayer. That is one of the phases that we are interested in.

We would see industry and municipality flourish and yet not dump its polluting refuse into our rivers and lakes. We realize the economic value of hydroelectric power, but not at that tremendous price

of nature's last natural fish hatchery on our Atlantic coast. We are economically old-fashioned enough to refuse penny wisdom for pound foolishness. To these ends and to the success of this conference we pledge our officers, our board of directors, our committee on conservation, and our membership throughout this land.

Now let those of us who finally found this meeting and those with whom we will have contact in the next 3 days go out to carry the languageless cry from the parched throats of "Hiawatha's brothers" pictured on that poster you saw as you came in. It comes to us and to our hearts, and let us take it to all the world. "Give us life", they cry, "give us our homes, give us the right to raise our young, and we will give to you, as we did in the past, the life abundant a hundredfold!"

I appreciate your listening. [Applause.]

Chairman LLOYD. I am sure I can only express your appreciation for the direct and pointed remarks of Mr. Rosengren, vice-president of the United States Junior Chamber of Commerce. His approach to the subject and his treatment of the subject was as direct as his approach to the microphone. Those of you who were here will remember it was very direct.

When I was in Tulsa, Okla., September last, almost everybody in town was talking about the tribute that had been paid to the women of that State in the election of one of them as president of the General Federation of Women's Clubs of the United States. Mrs. Roberta C. Lawson, the president, is on the program as from Washington. That may be the case now, but it wasn't the case in September, as I happen to know of my own knowledge. If she hadn't so artfully passed around by the door that the Junior Chamber of Commerce avoided, I was going to say that any young woman from Oklahoma would be able to approach the microphone as directly as the vice-president of the Junior Chamber of Commerce did, but I understand that our speaker has avoided that stunt and has come around where she can reach the microphone more readily.

I have great honor and great pleasure in calling on the president of the General Federation of Women's Clubs of America, because we are so happy to see them added to the whole general picture of conservation on this continent. [Applause.]

REMARKS OF MRS. ROBERTA C. LAWSON

Mrs. ROBERTA C. LAWSON. Thank you, Mr. Chairman.

I am also very glad to tell our chairman, our neighbor from Canada, that the General Federation also has clubs in Canada, so we are not confined to the United States alone in our membership.

In tying up the slogan of our General Federation of Women's Clubs, which is for this administration "Education for living", with our working program, not the least important of our projects is conservation of wildlife. I wonder sometimes if our organization is not numbered among the pioneer organizations who turned their thoughts toward the preservation of wildlife and the conservation of forests, because in 1898 the General Federation sponsored a Senate bill providing for the protection of birds, and then in 1910 we passed a resolution of approval of, and a desire to, cooperate

in the laudable work of the Audubon Society in its protection of bird life, and on down through the years we have continued our interest in the subject, until in 1932 we voiced our sentiments especially in favor of protecting doves and wild pigeons.

I wonder how many of you know that little story of the dove—how, long before civilization came, the dove was in the country, planting her nest in the vast prairie, preferably in the open where she might find protection and be able to see the coming of enemies; in a tuft of grass twisted and built up she made her little home and her nest. It is said there were often six and seven eggs in that nest.

One day civilization came along—a wagon drawn by oxen—and they ruthlessly passed over this nest. The little mother bird flew for protection, and after this monster had gone by she returned timidly to this little tuft of grass which so recently had been her home, and every egg was broken except two. She sat and moaned: "Broke all but two, broke all but two", and even today you will hear her making that same cry. It is a cry from afar, but it brings us a lesson today.

There can be no controversy over the statement that civilization has been lacking in its protection of wildlife. It has gone on ruthlessly destroying nests, feeding places, and habitats of our wildlife friends. Hence the need of a restoration of wildlife, of a wildlife organization such as we are seeking at this time to build.

The school room affords many advantages; it teaches theories and scientific facts, but nature itself is one of our best instructors. When one has camped, fished, and hunted from within the bounds of our neighbor country, Canada, along the Timagami and the Nipissing, on through these United States to Mexico, one fully realizes the full value of wildlife preservation in the social and recreational program of this continent.

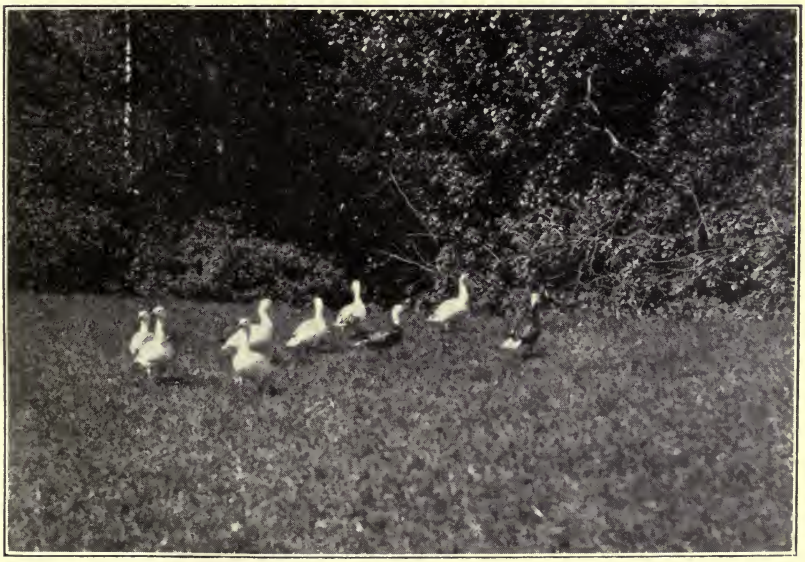
Wildlife study and outdoor living afford recreational and educational activities for boys and girls far beyond an estimated value. These bring to youth a recognition of itself as a part of the world, and give it an understanding of its dependence for successful living upon the laws of nature and obedience to those laws.

For instance, if we study the fox squirrel and the gray squirrel, there is the greatest lesson to give to youth. In my locality, not many years ago we were very much interested in seeing, one cold winter such as we are having now, the lack of gray squirrels. At least we found a good many dead around, and we wondered what was the matter. Upon investigating we found that the little wiry fox squirrel laid up in due time and in the proper season nuts and food for his future use, and the gray squirrel was a little more frivolous, I would suppose, just running around having a good time, perhaps going to pink teas and card parties, I am not sure, but anyway forgetting the food. And when wintertime came the poor little things had to travel so far from their nests in the forest out into the fields that they were overtaken by the hounds and wolves and other enemies along the way. There is a great lesson. Oh, there are so many things in nature which cannot be taught properly in the schoolroom.

I wonder how many of you have watched the Myna birds down in Hawaii. They are terribly squawky things; their squawk is even

B32969

A, Snow geese over Malheur Migratory Bird Refuge, Oreg. (Biological Survey photo.)



B32253

B, Snow and blue geese in Tillamook County, Oreg. (Biological Survey photo.)

B41840

A, Mallards and pintails hatched in incubators released by a sportsman at Delta, Manitoba. (Biological Survey photo.)

B41267

B, Nest of mallard eggs in plowed field. (Biological Survey photo.)

worse than that of our crow, but they are quite intelligent because they believe in organization, and therefore I bow to them. One day there was a terrible clatter going on among the Myna birds. I said perhaps they were having a convention. Perhaps they did have, because in a very short time down on the clearing under the tree there was formed a real circle of birds, with one in the center. Evidently he was a criminal or was guilty of misdemeanor in some way. One would jump out and give him a dig and then go back; then another, and they kept that up until he was properly chastised and really looked very humble indeed. Then they all flew away, and after a little he rolled in the dust and sand and then stood up and shook himself and I suppose said, "Well, we'll call it a day."

There are so many lessons that we might learn from nature and the habits of these wildlife friends of ours.

We have all been members of camping parties many times, and oh, the test of human nature that comes with these experiences. Football cannot hold any more thrills or controversies than a full-fledged camping party can. There human nature is revealed as it oftentimes is in the tactics brought about in our different athletic sports, because we find uppermost good traits where we expected bad, and oftentimes bad where we expected good, and some are more selfish than others. Then we all have enjoyed the excitement of around the campfire controversies: Who possesses the best sort of fishing tackle, and just which fly or plug is best to use around a certain hole or rock or stump, and then the fishing line is tested for strength and great controversy there takes place. Then oftentimes there is a battle over the relative merits of the setter or the pointer. We all know those things. And we come out of those squabbles with stronger affection for one another and a better understanding and knowledge of human nature and animal nature. So we learn the laws of nature and how they affect human lives.

Among the prized possessions of these experiences are increased appreciation of nature herself and natural beauty in art, literature, and music, as well as a better understanding of the spiritual life. Where can we get a better message from the Creator Himself than out in the open where we hear the whispering of the voice through the trees or in the silence of the night when the consciousness of protection comes to a human being?

We talk quite a bit at the present time of the wise use of leisure. Sometimes in this hurried age when we are rushing hither and yon from one thing to another, we wonder where is that mythical thing called "our leisure." Nevertheless we do know that people are having much more leisure than they used to have and that the way to spend it is rather a problem at times.

Can you think of any better thing for either children or adults than to be out in the great outdoors learning the clever secrets of nature? Isn't it real happiness which comes to one who learns some interesting habit or trait of a bird or other animal? For instance, that when the ducks start south they follow definite routes just as we in our autos go along a certain highway; and that the wild birds are nature's check upon the insects which destroy millions of dollars worth of farm and orchard crops in the United States every year and communicate diseases to men and domestic animals. What

small boy would not be thrilled by the knowledge that one bullbat's crop contained 500 mosquitoes!

Get our boys and girls out into the open. Help them to learn such things as these and we will have fewer criminals, we will need fewer crime laws. Some way, a boy who learns to love and live with nature cannot be very bad. Even start him, as we do sometimes in the West, to chase a road runner or chaparral bird, and though he is defeated he is very likely to be a better sportsman than he was before, and to have a real admiration for that little bird which could lead him such a merry chase and always outdistance him.

And what boy does not have his famous fishing hole? The boy who does not has missed half the charms of youth.

I remember well a number of years ago up in Colorado, fishing for trout, and our little boy, who is now a grown man, a member of the Junior Chamber of Commerce, I am glad to say, had a special guide to help him because he had never fished for trout before, although from the time he could hold a rod, he had been fishing. He was rather discouraged because those little wiggly things would not land just where he wanted them to, and so in the morning hour he tapped his father on the shoulder before anybody was up in camp, and said, "Daddy, let's go back to Conner's Lake where the fish love me."

Now we do have a feeling when the fish bite that they love us and we do have that reverence for them when they will come to our hook and line.

For the benefit of our hunting and fishing friends, here is another peculiar thing—fishing brings out a spiritual nature. A very dear girl friend of mine, on her wedding trip up in Canada, caught her first muskellunge. She had been feeling sorry for the poor little fish, but as soon as she felt the thrill of that old muskie on her line she began to say, "Oh, poor little thing, I know it hurts your mouth," and was talking to it so sympathetically, and when the guide said, "Careful, you're about to lose it," she said, "O God, help me to get it, and if you will help me to land this fish I'll eat my spinach always."

So you see all sorts of impulses are aroused when we feel that tiny wiggle on the line.

Although the expenditures by hunters and tourists form a most important source of income, and in certain States the tourist trade, part of which is based upon the attracting powers of wildlife, is recognized as the leading industry, yet one cannot fully estimate the stimulating and recreational value of wildlife, and it is difficult to accord them their place of true importance in our evaluation.

To many people the pursuit and capture of game has a recreational value quite as important as the food value or the commercial value. We are told that year by year there is an increasing number of visitors to the national parks. These visitors become acquainted with plant and animal life, their interest is stimulated and their education begun, or at least furthered.

By the way, what do we mean by the conservation of wildlife? Stopping all the hunting and shooting of game birds and animals? No, we do not contend that there should be no hunting and no fishing; these things are very definitely recreation, and perhaps wise recreation or wise use of leisure for some people. But we do be-

lieve in temperance in all things, and our most enthusiastic hunters might sometime remember that there are others who should enjoy these God-given creatures, and would if they but had the chance; also, that there are times when these creatures should be and must be protected by the hand of thinking man. We are admonished in the Bible:

> If a bird's nest chance to be before thee in the way in any tree, or on the ground, whether they be young ones, or eggs, and the dam sitting upon the young, or upon the eggs, thou shalt not take the dam with the young.

That is one of our old, old injunctions.

Also, let us remember that all human beings are not hunters and fishermen. Some get great joy from going out in the woods just to watch the animals at play and to study their habits of life.

I do like that definition I saw a short time ago: "Conservation is wise use." So conservation of trees is the wise use of trees, conservation of our natural resources is wise use of those resources, and conservation of wildlife is wise use of wildlife.

You remember the stern old patriarch of old who said, "Be ye temperate in all things," and happy is the conscience which does not overstep the laws of the land.

Our own organization, the General Federation of Women's Clubs, through the years has preached the care of the songbirds and forestry protection against fire and invasion. For example, where would the redwood forests of California be today had not the club women challenged the public mind to rise up against their devastation?

Senator Pittman referred to the Indians as hunters. I do not wish to be misunderstood, but it was not the Indian who killed off the buffalo herd.

Mr. Darling has given so many messages of helpful encouragement, and we do owe him a debt of gratitude for helping us in our program of work. It is also gratifying to know that new courses in colleges and universities have been instituted along the line of study which are helping and will help in the future this very organization which is being formed today to go about its work in a scientific manner.

I was especially pleased to see the program for my own State of Oklahoma Wildlife Federation Conference sponsored by the junior chamber of commerce in the coordination of all State federations and existing organizations. Surely we are going to give protection and restore homelands to these necessary wildlife friends of ours. Let us remember that God has lent us the earth for our life, and as individuals we have a great responsibility, not only to mankind but to all nature as well. [Applause.]

Chairman LLOYD. I am sure you are all glad to hear from Mrs. Lawson the thoughtful presentation of the woman's viewpoint on this wildlife conservation question. She came very close to my interests when she spoke of having fished in Timagami, because I was a ranger in Timagami before I was 21, and using the woman's prerogative I refuse to say how long ago that was.

Mrs. Lawson, I am sure we all thank you for your comments, and that we will all in this conservation work keep these other viewpoints in mind.

Our next speaker again presents a viewpoint that has not been presented to these conferences as often as it should have been, the scout, the boy, viewpoint. You have Boy Scouts and Girl Scouts in

the United States; we have Boy Scouts and Girl Guides in Canada, and I have enjoyed instructing and camping with both sides of that division. In fact, some people have been unkind enough to say that I like the girls' camps more than the boys' camps, but I assure you that is not true, and yet to have a little single four-gage shotgun and to endeavor to teach a class of about 20 girls how to handle it I found was quite as good entertainment for the instructor as for the class.

I am going to call now upon Mr. L. W. Barclay, director of activities, Boy Scouts of America, to give us the importance to youth of this wildlife conservation movement. Mr. Barclay. [Applause].

Remarks of Mr. L. W. Barclay

Mr. L. W. Barclay. I can answer that question in very few words. The importance to youth is that something worthwhile be done about the restoration and conservation of wildlife.

This morning I am speaking not only for my own organization, but for boys and girls generally, and of course for our over a million members among boys in this country and over 250,000 men who are in scouting. I am sure I can also speak for the Boy Scouts Association of Canada, because of my close relationship to John Skiles, of Ottawa, and also my friends of Mexico City, the Boy Scouts of Mexico.

As you know, the Scout movement is very well organized on a worldwide basis, and we keep a very close contact with these organizations throughout the country. We have followed the point of view of the conservative conservationist. The Boy Scout policy on conservation is an extreme policy. We have developed in this country camp properties which we own which cover more acreage than the Rocky Mountain National Park, in which we have very close to complete protection of wildlife, that is not only protection from destruction, but there is a splendid educational program in these camps in the field of propagating and restoring wildlife. They are almost as good an example as the national parks for a splendid job in the field of protection of wildlife.

We, of course, have a great problem in many of these camps, which is the problem of pollution, and this conference here can do a great deal for the boys and girls that go to camps if they can get at the problem of pollution.

Just briefly, I want to give you a little history because there may be some here who are not in close touch with what has been going on for 25 years among the Boy Scouts, similarly among the Girl Scouts and other girls' organizations, which might be of interest to you.

As you know, conservation, the protection of wildlife, has been placed in the Scout program in a very important way, and the reason for that is that boys especially enjoy doing conservation as a public service. We have taken a positive attitude toward this problem of protecting wildlife. So much of the work which we do in conservation is negative. I have had rather close contacts with protection of primitive areas, and of course in that particular case there must be a great deal which is negative, but if you are dealing with young folks, if you are dealing with youth, you must

be positive, like our good brother from the junior chamber of commerce, God bless him, typical of the youth of America—positive, straight from the shoulder, something definite. That is the key with boys and girls.

Instead of saying, "Don't kill the birds", "Don't harm the birds", our policy has been, "Make friends with the birds."

There have been a great many things over the past 25 years that many of you are familiar with, such as the building of bird houses and the feeding of and caring for birds in the wintertime, helping to stock ponds and rivers with fish provided by State commissions; they have worked with game wardens, Audubon Societies and Izaak Walton Leagues, park commissioners, State and national forests, in this cause of conservation. One of the finest pieces of work the Scouts have done (and other groups of boys and girls have done likewise) has been the serving as guardians for bird sanctuaries.

Practically all our camps, over 500 of them, are bird sanctuaries. There is a tremendous service to be rendered by boys and girls in the establishment of bird sanctuaries and their protection.

Of course, the dramatic activity of Scouts in forest fire fighting and in fire prevention is very valuable in the field of the protection of wildlife.

Scouts have come to be considered as a permanent body of active participators in every form of conservation and protection of wildlife and natural resources, a responsibility they have voluntarily assumed and are eager to do more as the days go by.

You hear from this platform and others of the crisis that we are in. There is no doubt that we are in the gravest crisis in recorded history in the protection of wildlife in North America. This is no time nor place for going into a long rigmarole of local figures and details of waterfowl groups seen here or bag limits killed there. The Nation-wide reports now before he American people are absolutely conclusive. For 15 years this crisis has been steadily approaching. Its progress all along has been due, in my personal opinion, largely to overshooting, killing and crippling in appalling figures, and the progressive extinction of wildlife.

From the three great fly-ways of the Atlantic coast, the Mississippi Valley, and the Pacific coast, the majority reports are that the flights of ducks and geese in the autumn of 1935 were the smallest and poorest that ever were known. In hundreds of hunting places the birds have been so scarce or absent that there was no good hunting. A dozen reasons for duck and goose absence may quite truthfully be cited. The shotgun is not by all means the sole cause of waterfowl disappearance. But I believe far beyond all others it is the chief cause. I believe it is the millions of guns that make it so. Conservationists are everlastingly right in demanding drastic reforms in the excessive use of guns. First, last, and all the time we stand unitedly with them—the men who for so many tiresome years have struggled and fought to save a decent heritage of wildlife for the boys and girls and the outdoor people of America.

No one knows better than I the bickerings and differences and alleys and tangents on which conservation groups have gone. There isn't any field where there is as much difference of opinion, it always seemed to me, as in this field of the protection of wildlife. We have got to come to a common denominator of all these points of view and

develop certain major objectives which may not suit everybody but which will mean restoration and conservation of wildlife.

We refuse to throw overboard the ideals of conservation in behalf of any problematical and visionary restoration. We want to see more and better conservation along the lines which Mr. Darling emphasized when he said:

> The only controllable element affecting the duck population is the annual kill by the guns of sportsmen.

We call upon the sportsmen of the United States to hereafter more rigidly observe and enforce the best ethics of sportsmanship, by crippling fewer birds instead of many, killing no unlawful game for guides, boatmen, or friends, and helping to suppress the bootlegging sale of game, and by keeping away from the duck assassins. We denounce the mean and wasteful system of permitting a hunter to kill $500 worth of birds for a paltry State hunting fee.

What else can the American people expect from their dastardly treatment of American small game than its total extinction in the near future?

One of the papers this morning spoke of whether conservation was conservation or conversation. I will plead guilty to having been a participant in a great deal of conversation conservation, but we have to talk ourselves up to a white heat before we get ready to do something. Now with all these meetings on restoration and conservation of wildlife going on at this minute over this town, we hope that there will be a white heat developed and that there will come out a very definite program upon which I don't hope for much more than a majority agreement, but behind which every group interested in the future protection of wildlife will get.

I make my appeal not on the economic basis—you heard that this morning; I think it always pays to do the right thing, but I make my appeal to this federation which is developing that it shall discover the leadership, that it shall create the program, that it shall get from on high the energy to go through with this thing for the sake of future generations of boys and girls, so that they may have some of these good things that I and my father and my grandfather had in the woods in Canada where I was born, and it is from now on that we must do that very thing.

I make a little different application of this poster Please Give Us a Break, and instead of those lovely birds and the lovely wildfowl on the poster, I paint the faces of boys and girls all over this country, all over this North American Continent, and on behalf of those boys and girls I say, "Please give us a break." Whether or not that break comes depends, as I said before, on getting up to a heat for action, discovering the leadership—we must have a man and men who have a vision and a capacity to lead us from disunity into unity; we must have through the wisdom of all those related to conservation and the protection of wildlife, a program; then we must go at it and put the job over. Organization is important, but most important of all is what result the organization gets.

I think I can promise you that the boys and girls of the schools of this country who feel that we have a right to this wildlife, its inspirational value, its educational value, will give their cooperation.

In the case of the Boy Scouts of America in this country with its million and a quarter membership, I can pledge you that we will cooperate and do all that we can, and I know these boys will help to promote and carry through the educational effort which will be necessary before our people will become convinced that this is an emergency and that they must take a new point of view toward it.

It is through cooperation, coordination, a program, and leadership that we shall succeed. I pledge you the idealism of the youth of the country, and I pledge you the support and active work of the Boy Scouts of this country in over 32,000 communities. [Applause.]

Chairman LLOYD. Mr. Barclay in giving us the view of the united boys in the Boy Scout Association of America has done us a privilege. It is a wonderful thing to think that we can call on this army of youth.

That finishes the set part of the program.

Mr. SETH GORDON. I would like to present to this audience three of the healthy young Americans Mr. Barclay was just talking about. I am going to ask the first one to tell you his name and what troop he belongs to and where.

GERON RATHELL. My name is Geron Rathell.

Chairman LLOYD. You are a cub, is that right?

GERON RATHELL. Yes.

Chairman LLOYD. Tell them what a cub is. These people are very ignorant.

GERON RATHELL. A cub is a boy that belongs to the Junior Scout organization.

Chairman LLOYD. And what is your name?

WILLIAM BELL. Billy Bell, Troop 13.

Chairman LLOYD. What is the service star?

WILLIAM BELL. One year in service.

Chairman LLOYD. This boy has lots of badges. They are hard to get. How many have you got?

JACK LATTIMER. Thirty-three.

Chairman LLOYD. Thirty-three merit badges, showing accomplishment in education. I think that to have gained that many badges is at least equivalent to a high-school education in itself. And what is your name?

JACK LATTIMER. Jack Lattimer, Troop 83, Washington, D. C.

Chairman LLOYD. How many years a Scout?

JACK LATTIMER. Four.

Chairman LLOYD. I think that is a fine showing of three different stages in the development of the Scout. I only wish we had some Girl Guides here, because I have been henpecked for years by three generations of Girl Guides. Everybody in my house except me is either a Guide or a Scout or a has-been, and the older ones are the worst.

Mr. SETH GORDON. Mr. Chairman, I think it would be well to throw this open to general discussion before we make some announcements for the morning. You have had so much real meat here this morning that I feel some of you are ready to bubble over with enthusiasm and add your comments. I think this is the op-

portunity for these folks out on the floor to add their comments. I am sure they have something to say.

Chairman LLOYD. If they don't offer to speak I will name them and tell them they have to. I will start with Gen. Sir James MacBrien, Commissioner of the Royal Canadian Mounted Police. [Applause.]

REMARKS OF GEN. SIR JAMES MACBRIEN

Gen. Sir JAMES MACBRIEN. Thank you, Mr. Chairman. This is a very unexpected pleasure to be called upon to speak. I have listened with great interest this morning to the various addresses. We Canadians are here to learn what we can of the plans that you are making and from your experience. Your problems are ours. I think perhaps we have taken the work in hand a little bit earlier than you have and our resources of wildlife are not near the point of exhaustion that I gather many of you are.

I fear that I haven't any constructive comments to make, except that I was very much impressed by the remarks of the last speaker, Mr. Barclay. I think if you start your educational work in this connection with the youth of your country, that is the best plan to follow. If you get the boys and girls of this great country definitely interested in conservation of your wildlife, of your forests, and all, your marine life too, then you will need have no fear of the future with respect to all those resources which are so valued.

I thank the chairman. Perhaps I shall penalize him later on in some way or other for forcing me to speak so unexpectedly. Being a policeman, we have our own ways of getting even when we get back home. [Laughter and applause.]

Chairman LLOYD. Thank you, General MacBrien. This is just a small party, but with wide interests. Many of you here must feel impelled to say something. Don't let the size of the auditorium bother you. You are among friends whose hearts are warm.

I will call on Mr. Harkin, Dominion executive of the Boy Scouts of Canada, to say a word of comment on the Boy Scout work there. He is also Commissioner of the National Parks of Canada.

REMARKS OF MR. J. B. HARKIN

Mr. J. B. HARKIN. I have been very much interested in the very great advantage of serving on the general executive board of the Boys Scouts in Canada.

So far as conservation is concerned, I long ago reached the conclusion that we can achieve everything we aim to achieve if we can only make conservation a matter of conscience with the public. In the end that is what we want to do. I haven't any doubt that if we get the school children and the Boy Scouts and the women's organizations especially, all working toward that one idea of making conservation a matter of conscience, we will achieve everything we aim for.

So many sportsmen so deliberately break the sporting laws. Many of them unfortunately consider that game laws are for the other fellow, not for themselves. I know the great temptation to exceed the bag limit, but nevertheless fundamentally if we can only get everybody feeling that he must observe what his conscience tells him to observe, conservation will very soon be accomplished. [Applause.]

Mr. GORDON. I see Prof. George Green, of State College of Pennsylvania. He has done a lot to arouse interest in just this type of discussion.

REMARKS OF PROF. GEORGE R. GREEN

Prof. GEORGE R. GREEN (school of education, State College of Pennsylvania). May I say that educated as a forester and having taught forestry for 25 years, and for 10 years now having been transferred over to the school of education, I have been following this conservation problem very, very closely. There is one phase of the conservation problem that it seems to me so far has not been presented to this great conference. By that I mean the work of teaching this problem in our public schools. If we can get this problem presented to the present generation in the proper form, I feel that the solution of our conservation matters will be reached in the next generation.

The great difficulty in getting this particular problem in the public schools is, first, that the public schools today and the teachers themselves feel that they already have too many phases of education and too many different things to present; and, secondly, that the authorities themselves feel that there is no time in the public-school system for an additional phase of education. Those two big problems must be met by public sentiment and by public opinion. As you all know, public opinion in America, this democratic land of ours, is so enormous that if public opinion decides that this sort of thing should be taught in the public schools then it will be taught there.

I have for a number of years been doing a lot of experimenting in teaching this sort of thing in the public schools, and the one big obstacle that we have met with is the teachers themselves. If you can educate the teachers, if you can get them to be as enthusiastic as our friend the vice president of the Junior Chamber of Commerce, for instance, on this problem, or as any of these speakers, then we are going to put it across.

The youngsters are anxious to get into the thing and the youngsters will go the limit, but the thing is to get it to them.

It seems to me that there again we have a big problem in getting this thing across to the public-school teachers to get them sold on this idea, to get them enthusiastic about it. They are the great body, after all, that are coming into contact with every phase of youth, from the youngster in the primary grade right on through. We can very easily teach a few fundamentals of conservation; we can get the youngsters out in the field, we can teach them the esthetic as well as the economic and leisure values of this sort of thing. When we do that and when we do amalgamate it with the other phases of education in the public schools, then I feel that we are nearer a solution than in any other way that we have attacked it so far.

There is just one other phase that I want to mention with regard to education. I am not opposing the R. O. T. C. and that sort of education in the colleges, but as you all know, in most of our land-grant colleges boys must spend 4 years in the manual of arms and learning the various tactics of war. If America could, in some way, develop a system whereby students should be forced to take 1 hour a week of conservation in all of our great State schools, then we would be getting somewhere, and if we could teach the boys instead

of the manual of arms for war, the manual of arms for sports and for game in the field, I think we would get somewhere.

I did not intend to speak, Mr. Chairman, to the length I did, but this is a problem that is very warm in my heart and I feel that the educational problem in the schools and colleges is one that certainly we want to take into consideration in this whole thing. [Applause.]

Chairman LLOYD. Mrs. Buck, won't you come up and speak to us?

REMARKS OF MRS. J. L. B. BUCK

Mrs. J. L. B. BUCK (General Federation of Women's Clubs, Richmond, Va.). I really have very little to add except amen to the speakers who have just spoken about the importance of reaching the teachers in the public schools. That is where I think the women's clubs can help, perhaps bringing to them a realization of the importance of getting it across to the teachers. We mothers I think frequently expect the teachers to take over all the problems which we are not able to handle in our own homes, but I do feel that perhaps that is one that could be taught especially well in the schools. I also feel that we want to meet that word that was spoken in the paper this morning—the difference between conservation and conversation, and I hope our women's clubs are going to be able to meet that challenge.

QUESTION PROPOUNDED BY MRS. NAN LIPPITT HATCHELL

Mrs. NAN LIPPITT HATCHELL (Jefferson County Junior Bird Club, Charles Town, W. Va.). There has been trouble with skunks and red foxes in the Shenandoah Valley in the destruction of fowls and game. Will the chairman advise what method should be taken to remedy this?

Chairman LLOYD. I would suggest, without knowing the particulars, that that would be a matter for the State game department, probably with the assistance of the Biological Survey. The State Game Commissioners of West Virginia and Virginia are probably at the conference.

I am going to call on Mr. Darling to sum up some of the general features of the program of the morning.

REMARKS OF MR. JAY N. DARLING

Mr. JAY N. DARLING. Without going into details and mentioning each speaker by name, I wish to thank all the various participants in this morning's program—they have each contributed tremendously to clarification of our wildlife conservation problems.

I want to apoligize for the small audience. Senator Pittman's address was an inspiration. It is a tragedy that the storm kept so many away.

I do want to add a word to the discussion of the educational problem, because an incident in the effort to promote an educational program through the agency of the United States Bureau of Education generates part of the momentum out of which this conference and the idea of a federation was born. The United States Commissioner of Education, Mr. Studebaker, put into his budget an

item of $25,000 to work out a system of textbooks and methods that might be introduced into the various junior, intermediate, and senior grades of our educational system. He got it through his department and up as far as the Bureau of the Budget, where it was scratched out. With the canceling of that item in the Budget our best hopes died for a national educational contribution to our conservation movement. It was a major tragedy and yet in spite of the general demand for conservation education the public was entirely unaware, either of the plan or the denial of support of that plan by the Budget. Your influence could have saved this project from its untimely death but until you are organized there is no way in which such important matters can be presented to you.

As I said in my address yesterday, I have seen the memorandum from the Secretary of the Treasury that the only way you can get support for wildlife is to approach it by the voice of the public through your Congressman.

Another item will interest those of you folks who are bent on the educational side. I wanted to have an avenue to distribute the tremendous amount of information on wildlife conservation which is annually produced in Washington bureaus. The State agricultural colleges seemed to offer an excellent avenue to get some of the important conservation material into the hands of the land users.

I asked for $42,000 that I might establish a cooperative educational movement in a few experimental land-grant colleges well distributed throughout the United States. The plan was to grant $6,000 of Federal funds to any State land-grant college which would in turn contribute $6,000 in service and equipment. The State fish and game commission was supposed to come in with another $6,000 in the three-way cooperative arrangement and with this fund to demonstrate the practical methods of wildlife restoration and conservation extension.

We did get the $42,000 request past the Budget Bureau, with the Secretary of Agriculture endorsing it, and we rode as far as the appropriations committee in the House. When we got there they asked questions about what this was for. We explained its logical benefits to all concerned. We emphasized the great need both for education and demonstration. We pointed out the precedents in Federal and State cooperative activities and the expressed desire of the States for this particular project. Our pleas made no evident impression, for the item of $42,000 was crossed out. At the next session of the committee hearing a Congressman came in and leaned over the shoulder of the chairman and said:

> Where is that item that they call the land-grant college wildlife educational item?
> There it is.
> Why scratched out?
> Yes; scratched out. We're not going to allow that.
> Well, I'd like to have that in.
> Oh, all right.

And so it was put back in the bill.

It was interesting to note how that Congressman happened to intercede for the project. By accident in one of my trips around through the States and visiting the various commissioners I mentioned this land-grant college educational proposal to one of the

State conservation commissioners. He wrote to his Congressman and said: "See if you can't get it for our State land-grant college." That is all that happened, and we got the $42,000, just because one Congressman went in and said, "Why did you cross that out? I want that."

There is the answer to your wildlife problems. One word from a Congressman is worth more than all the pleas and begging from a bureau official. Put your demands in writing with a firecracker in it, underneath the Congressman's coattail or you aren't going to get anything for wildlife education.

I don't know of anything that seems to me to offer a better field of activity for this national wildlife federation which we are talking about, than to make our first drive for conservation education in our public-school system. Thirty million people each day in school is an audience worthy of attention.

Think of the benefits which might have resulted from that $25,000 with which the United States Commissioner of Education was going to set up a general public-school course in conservation. And no Congressman to lean over the shoulder of the chairman of the appropriation committee and say: "I would like to see that item allowed!"

I want to mention one other thing that has come to my attention on the educational problem. The Audubon Society this year is fathering an outdoor wildlife education camp in which they give a 2-weeks' course to any teacher who will come there and take this course at a very low cost; I advise you to look it up. I venture to say it will contribute very much to the problem which Dr. Green has just mentioned in providing our public-school teachers with methods by which children may be interested. We are still teaching them the difference between the corolla and the cotyledons of a dandelion and we aren't bothering very much about the food and environment which give life and sustenance to our wildlife species.

We can have conservation taught in our schools. We can have wildlife projects supported by Federal aid if we will see that our representatives in Congress and the State legislatures are made aware of our desires.

Thank you very much. [Applause.]

Chairman LLOYD. Thank you, and I see that you all appreciate Mr. Darling's setting off the firecrackers for enthusing you as well as others.

If there is no further discussion the general session stands adjourned.

(The meeting adjourned at 12 o'clock.)

TUESDAY, AFTERNOON SESSION, FEBRUARY 6, 1936

The meeting convened at 2:25 o'clock, and was opened by Mr. J. N. Darling.

Mr. DARLING. For those who have not been in the previous meetings I want to reiterate the pleasure which we feel in the cooperation between the Republic of Mexico and the Dominion of Canada with this Government in this wildlife gathering.

Sr. Juan Zinser, commissioner of wildlife of Mexico, one of the most enthusiastic and active men that we have in this whole group

of people gathered here together, will be your leader of the afternoon forum. Sr. Juan Zinser!

Chairman ZINSER. Ladies and gentlemen, Mr. William Tucker, commissioner of Texas, will tell you something about wildlife, instead of Mr. Richard Kleberg, who is now sick and can't be here this afternoon.

REMARKS OF MR. WM. J. TUCKER

Mr. WILLIAM TUCKER. Mr. Chairman, ladies and gentlemen, I have spent a great deal of my time talking to Congressmen. I don't know that ever before was I privileged to talk for one.

It is regrettable, indeed, that the Hon. Richard Kleberg, on account of sudden illness, is unable to be with you this afternoon. I know that most of you know something about the man whom we, in Texas, affectionately know as Dick Kleberg.

Down in the southwestern portion of Texas there is a landed empire of 1,250,000 acres, builded by stern efforts and shrewd management of livestock. The Richard Kleberg who was to speak to you this afternoon owns and manages those properties.

Long years ago the Klebergs realized that if the land was to retain its pristine lures and be attractive as it was to the pioneers, it would be incumbent upon them to protect the game resources of that section. Though the early pioneer settlers were not always thoughtful of game protection, when the hand of the law was weak, those forward-looking men took up the battle until they have builded at this time a game empire like none other in the world.

When we were in the doldrums of game conservation, looking for a pittance from our Government, when the sportsmen all over the land were crying for the opportunity to contribute something legally toward the conservation battle; when, after Congress had repeatedly turned a deaf ear to the cries of the sportsmen throughout the land, your Congressman, Dick Kleberg, became the author of your Duck Stamp bill and, with the aid of "Ding" Darling and a lot of other energetic Government officials, pushed it through Congress in a single session.

Therefore, you well realize that I can't talk for the representative of our State who is prevented from being here on account of illness.

It is a pleasure and an honor to appear here before you. I realize that it is difficult, in conferences of this kind, to get the attendance at serious sessions of the conference that we would like to have. In the morning everyone doesn't get up on time; at noon some of them eat too much, and it is difficult, out of the three or four thousand people that we have in Washington, to get the representative crowd out that we would like to have.

For many years it has been my pleasure to attend your national conferences, groups that were striving to do something for the wildlife resources of our nation. Never before has it been my pleasure to participate in a meeting that was so thoroughly representative of the conservation and restoration thought of America as is gathered here in our Capital City. Never before has an attempt been made by the conservation-minded people of America to reach out in a thoroughgoing democratic way and to bring together all of the existing conservation sentiment of this country of ours.

Other organizations have pioneered the way. They have done much effective work. I pay all tribute to the excellent work which they have accomplished, the fact that they have been able to keep alive the spark of conservation until a larger number of Americans could become aroused to the necessity and exigencies of the situation.

We are gathered here now for the purpose, not of a centralized organization reflecting the sentiment of a few men, not a few groups with individual ideas and aims, but people from all over this North America of ours, determined that we shall have a thoroughly democratic organization reaching to the far open spaces of the West and to the storm-beaten coast of your Atlantic, from the Great Lakes to our Gulf, with our neighbors from Canada and Mexico determined that we shall preserve for future generations of Americans those things which have made America great, those things which instill in the citizenship of our land that rugged individualism that makes North American people different from those of other sections of the world.

We have decided that we need those things. In the troublesome times that we have passed through, in the troublesome times that we may have in the future, we need for America's sake, for your sake, for your boy's and your girl's sake, and for my boy's sake, to get behind this great movement so that we will keep the backlog of conservation sentiment burning so strongly that it will heat the interest in Washington into the actions which will speak for all America.

I thank you. [Applause.]

Chairman ZINSER. Now I am going to introduce Mr. Seth Gordon, Commisisoner of Pennsylvania, who will be so kind as to introduce Dr. Phillips.

REMARKS OF MR. SETH GORDON

Mr. SETH GORDON. I don't think, Mr. Chairman, that it is necessary to say very much by way of introduction. The next speaker is so well known to all of us who have been interested in wildlife restoration in North America that words of introduction seem needless, but for those of you who do not know Dr. Phillips, who have not worked with him side by side as many of us have, let me say to you that he is one of those outstanding naturalist-sportsmen who have made this movement what it is today and who have laid a groundwork upon which we are in position to build right now.

Those of you who are interested in waterfowl know about his wonderful books on that subject. I wish that that big set of books could still be bought, but apparently they can't be bought except through the second-hand book stores. (I'm not selling books now.) But there are many other volumes on this same subject which Dr. Phillips has written, one of which he has been coauthor of with Dr. Lincoln.

But one of the things I like to think of in Dr. Phillips as outstanding is the fact that he has always not been locally or nationally minded, but he has been internationally minded, and he has cooperated with every agency in other parts of the world interested in the conservation and restoration of wildlife and all the other things that go to make the outdoors worth while.

For those of you who remember the American Wildfowlers, Dr. Phillips was the president of that organization for some years.

Now, without further introduction, Dr. John C. Phillips, of Boston, or Wenham, Mass., but we like to think of him as belonging to all of North America, Dr. Phillips.

Remarks of Dr. John C. Phillips

Dr. John C. Phillips. Mr. Chairman and members of the conference: From time to time sportsmen from this country, and collectors—scientific collectors—have been to Europe and Africa and Asia on expeditions of one sort or another, and some of these men have come back interested in some of the vanishing fauna which they have come in contact with, and it is more or less to correlate that interest and make it effective that we organized some 6 years ago this little American committee for international wildlife protection, which I am going to say a few words about.

It may seem to the members of this conference farfetched to talk about efforts in international wildlife protection when so much new leadership is desperately needed here at home. But as I understand it, you are this week launching a plan to internationalize and coordinate conservation activities in the whole of North America, and perhaps (I hope, at least), your influence will extend even further South. This is as it should be, for every year we see more necessity for world-wide cooperation in order that sufficient breeding stock of many threatened species be preserved for posterity.

I want this conference at least to know that there has been in existence for the past 6 years a small, informal committee, organized and financed through private resources, with the object of coordinating international nature protection thought in this country, and of encouraging foreign societies whose aims are similar to ours. And, when I speak here of "international", I am referring to everything outside of this country, not to Canada and Mexico.

At this point you may well ask why waste precious time and dollars on some forlorn hope in Africa or Asia, where the United States has no possessions, or vital interests of any sort. Well, we think there are several reasons for a world viewpoint. I will try to give these as I see them, but I will not have time to go much into the details of our work or the story of its inception.

In the first place, as that fine Frenchman, Paul Sarasin, said so beautifully many years ago, a species once gone can never be replaced, and its loss is a crime against world civilization. Now, on the heels of accelerated development in the colonies, in Africa and Asia, especially since the war, a state of things exists in Africa and in parts of Asia not very unlike the feverish expansion of our own West in the last 25 years of the past century. Only, unfortunately, now we have to add to the forces of destruction many mechanical inventions in transportation and engineering that contribute ever more rapidly to the far-reaching destruction of our natural environments.

In some colonies belonging to European nations there are well-regulated game departments; in others almost no sentiment can be whipped into action to save the remaining wildlife from oblivion.

Unique species are everywhere threatened; and sometimes we are bold enough to hope that a little pressure from far away America may be of real service. Curiously enough, there seems to be less resentment at a suggestion from an unprejudiced foreign source, like our American committee, than from the colonial home office which controls the destiny of distant colonial residents, in Africa and such places as India and the Malay Peninsula.

Then again the foreign nature societies, and some of them have definite government recognition and are semiofficial in character, are always hard pressed for funds, for it is very much more difficult to obtain backing for altruistic nature protection in Europe than it is, or at least has been, in America.

And, lastly, we believe that international nature protection is one of the subjects in which nearly all right-minded people have sympathy, and that through definite pledges of American support we can at least help to promote good feeling among our foreign fellow-workers. And Heaven knows there is nothing so important as international good will these days.

We are not essentially a group of sportsmen, nor do we represent over-sentimental elements. Our advisory board is drawn from zoological societies and museums from Massachusetts to California, as well as from clubs of outdoor enthusiasts, such as the Boone and Crockett, the Campfire Club, and the Wilderness Club of Philadelphia. The actual work is done by a small executive committee with temporary headquarters in the Agassiz Museum, at Cambridge, Mass., so that we have absolutely no overhead expense except for the salary of one girl secretary.

Our expenses are met by contributions from these same museums and societies and from a small group of individuals who have become interested in foreign wildlife through hunting, exploring, or or scientific collecting.

In our office in Cambridge we have built up a valuable file of information on threatened species the world over, and our files are classified under the names of the animals themselves as well as by countries, and in this latter file more generalized information, such as pertains to protective laws, nature reserves, and local societies, is kept.

We wish to lay no claim to priority in international work. Dr. T. Gilbert Pearson, of the Audubon societies, was in the field long before we were, but his efforts have been principally directed toward improving the status of European birds, more especially the migratory species, so there is little or no conflict with our work. Our work has been devoted mostly to trying to do something with the larger forms which of course are going most rapidly.

Our committee was really an outgrowth from the Boone and Crockett Club of New York, of which Madison Grant is president, and the New York Zoological Society. That club has taken an active interest in the work of Dr. P. G. van Tienhoven, of Holland, for many years. He is the leading conservationist, I think, in Europe; and also in the activities of the British Society for the Preservation of the Fauna of the Empire, a very long name but a very fine organization.

Through the officers of the Boone and Crockett Club considerable sums of money were raised a few years ago for the work of the

B14099

A, Gulls in a field. (Biological Survey photo.)

B5445M

B, Flushing bars on mowers save many quail from being killed or injured. The bars are supported by the mower tongue and frighten the quail from nests and hiding places in the path of the mower. (Biological Survey photo.)

B33405

A bobwhite quail 11 weeks of age. (Biological Survey photo.)

London Fauna Society, following Mr. Hobley's visit to New York in 1930, Mr. Hobley being their secretary.

Dr. Derscheid, of Belgium, and Dr. van Tienhoven, of Holland, made personal appeals to our American committee in 1931 and, I may add, they met with very good success.

Here I will list the most important agencies abroad which are actively working for protection of threatened species, for the control of smuggling of forbidden animal products, such as hides and ivory, and for the creation of parks, special nature reserves, and game reserves.

In London, the Society for the Preservation of the Fauna of the Empire, of which Lord Onslow is president, and Mr. C. W. Hobley, secretary, has been working for many years, and publishes a fine journal quarterly, with news from all over the world, particularly the Bitish colonies.

In London is also the Royal Society for the Protection of Birds, which has done much to popularize the dangers to wildlife through pollution of the sea by mineral oils.

In Holland, under the leadership of Dr. van Tienhoven, is the Dutch Society for Nature Protection, founded in 1925; while in Brussels in the very important international office of documentation and correlation for the protection of nature, which has functioned actively since 1928. This society now has the backing of several European governments and is the most extensive source of information on threatened exotic species of mammals over the whole world. It is now presided over by Dr. van Tienhoven.

In Paris we have the headquarters of the Consiel Internationale de la Chasse, of which Count D'Adix is secretary. Their president, Monsieur Ducrocq, who visited this country last year, is much interested in the better protection of game, more uniform seasons on migratory birds, and a more complete understanding of game problems among influential sportsmen all over Europe.

Dr. Pearson's International Committee for Bird Protection dates back to a meeting in London in 1922, but the first official meeting was held in Geneva, Switzerland, in 1928, so that our own Audubon Societies were really in the field before some other European organizations.

In May 1929 the Pan-Pacific Science Congress, meeting in Java, appointed a standing committee for nature protection, and this committee meets every 3 years. We have been recently appointed to represent the United States on that committee.

Another activity of this nature is a committee on protection of whales, appointed by the American Mammalogical Society, of which Mr. Remington Kellogg, of the United States National Museum, here in Washington, is chairman. The New York Zoological Society has for a long time helped foreign projects of various sorts with special activities, and a good deal of money has been sent to South Africa and also to Europe, in the hope of saving the European bison, which, as you perhaps know, is nearly extinct. Then, also, our own Mammalogical Society has a little protection committee.

Many other groups interested in saving threatened fauna and flora exist in other places—in India, South Africa, Australia, and New

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Zealand—but these are too numerous to mention here. Our committee has been in touch with some of these.

One of the most important activities of our committee has been publication, and the following list (which I don't think I will read) shows a rather varied interest.

There was our first report, a study of the relation of game in Africa to the tsetse-fly-borne diseases, and that is one of the desperate problems in Africa, because unfortunately some of these fly-borne diseases have some relation to nagana, the cattle disease which decimates cattle in Africa and that has resulted in the extermination of game over wide areas in order to try to wipe out that disease.

We have also published several other numbers on Africa; one on migratory-bird protection in this country; one on the status of the musk ox around its whole range, a certain polar range in East Greenland, North America, and the Arctic lands, and so on.

We have several ambitious plans for study and publication in the future if we can finance them. Our main objective, of course, is to promote the preservation of rare species in all parts of the world and the setting aside of permanent nature reserves.

International events of recent interest: One of the most important advances in international nature protection was made in London in 1933. This centered about the convention called to consider the problems connected with the saving of animals and plants in Africa. This country sent an observer to this conference, and the American committee had the honor of sending its chairman to represent the United States. All the African colonies and protectorates were represented at the convention, as well as the Union of South Africa and even Ethopia.

Last month that convention was ratified with the necessary number of signatures, so that we now have an international treaty aimed to serve nature protection in Africa, a very important step. A late report and map shows that great continent, once spoken of as dark, with more than 100 nature reserves of one sort or another. This is surely a good start, even though many of them are little more than lines on paper.

A year ago an all-India nature conference was held in Delhi, India, and it is expected that a very important convention, similar in nature to the recent one in Africa, will be called soon in London to consider the preservation of fauna and flora in Asia, the East Indies, Australia, and New Zealand. The United States should, of course, be officially represented at this time, on account of our Pacific possessions.

To go back a few years, the first international conference on nature protection was held in Bern, Switzerland, in 1913. It was organized by Paul Sarasin, and 17 governments were represented. The war prevented the decisions of that conference from ever coming into effect, but in July 1928 there was held in Brussels the important meeting of the Union Internationale des Sciences Biologiques, at which time the Brussels office, of which I have spoken, was authorized and launched.

There was also a Paris conference on nature protection in 1931, and a Pacific Science Congress, mentioned above, also in that same year. In a way these led up to the London conference of which I have just spoken.

In the meantime, what has this Government, our Government, done recently to further international work? We all know, of course, of the whaling and sealing and fishery treaties, many of which have been in existence a long time, but I am not speaking of those. Curiously enough our Government has taken a step fully as important, if not more so, than any European nation, and one which other countries might well emulate, namely, by passing the Vandegrift Tariff Act of 1930, which makes it possible to confiscate any animal products which have come from animals or birds taken in their country of origin in violation of local game laws—a very important law. This has since been strengthened, in 1935, and combined with our own Lacey Act, the Interstate Tariff Act. If similar precautions could be taken in Europe, smuggling could be more easily detected and punished, for with some products, such as ivory and rhino horn, there is no method of confiscation once they leave the shores of the continent of origin.

Some immediate problems: The problems which confront the nature protectionist outside of North America are far too numerous to list here. Just a few examples, and then I will finish.

There are in the whole world, for instance, only five living species of rhinoceros. Of these the great Indian one-horned rhino is confined now to a small region in Nepal, India. The lesser one-horned species, Sondaicus, is almost extinct on the continent of Asia, but a few are left in a reserve in Java, and there are a few in Sumatra.

The two-horned Sumatra species, Sumatrensis, gone in Java, is very rare on the continent of Asia, but still endures in Sumatra.

The great white rhinocerous, of Africa, is reduced to a small herd in the Umfolosi reserve in Zululand, South Africa, and has also a small range in northern Uganda and a part of the Belgian Congo, where it is being given protection.

The common black rhinoceros, although extirpated in many parts of Africa, is not in any immediate danger, but, remember, there is a price on the head of every member of this unfortunate family, for their horns are literally worth their weight in gold in the oriental drug market, where they are used for medicines by the Chinese. A native who kills one becomes a financial prince.

In South Africa, where there existed a very peculiar fauna, the white settler pushed his invasion a long time ago, and has nearly wiped out some very unique and beautiful species of antelopes, mountain zebra, and a peculiar race of elephants. The Quagga became extinct many years ago, and the mountain zebra is reduced to 40 or 50 individuals, and nothing can save them except the creation of a special reserve, with adequate protection, within a year or two.

One of the worst of all problems in Africa is the apparent relationship between tsetse-fly-borne diseases and a disease of cattle called nagana, which has resulted in wholesale experimental killing of game, especially in Rhodesia, a great mistake, perhaps, for we do not know the whole story about these fly-borne diseases as yet.

In Asia, Pére David's deer is extinct, and so probably is the splendid Shombourk's deer of northern Siam, while other deer in Siam and Burma are in great danger on account of the value of their horns for medicine, and the entire absence of protective measures. In the Malay Peninsula nearly all forms of wildlife are being swept

away on account of the rapid development of that country for rubber and other products.

Almost everywhere over the world valuable fur-bearing animals are in grave danger, and here I would merely mention the chinchilla, of western South America, which has been very sadly reduced. All praise should be given to the Russians for the recent protective measures they have initiated for the protection of Russian sable.

In the seas many species of whales are seriously reduced, with certain seals and sea otters in danger. The international whaling treaty, which was signed by the United States among other nations, may delay total extinction, we hope.

So-called progress cannot be stayed, but we must do our best in arousing public opinion against unnecessary extirpation.

And so we think there is room and to spare for an international wildlife protection group in this country which, if kept small and informal, can at least operate without any political ax to grind, and do something to show our friends overseas that nature protection is something of world concern. Our own State Department, in one of its letters to a foreign government, recently has lent its weight to this opinion; namely, that the preservation of threatened species is of vital concern to all nations.

Thank you. [Applause.]

Chairman ZINSER. Mr. Darling, of Iowa, will now introduce Mr. Frederick A. Delano.

REMARKS OF MR. JAY N. DARLING

Mr. DARLING. I don't know how many people here got up early enough this morning to read the papers, but at least one of our national commentators had in his column an item to the effect that there were gathered here several thousand persons interested in wildlife bent on the object of finding better ways to destroy it.

Anyone who read that and attended these meetings must have known the error, but it also proves, at the same time, that when one of the chief press spokesmen in this country gets that idea of conservation congresses we must do something about it to justify our existence and bring forth our ideas as they exist, and not as killers.

That column was a distressing thing. Dr. Phillips' paper was a complete denial of its truth. I have heard no expression that upholds Mr. Brisbane's statement in the morning paper. I want to officially resent it. [Applause.]

As a former Government official interested in the coordination of activities in our various governmental agencies I have been aware of the many suggestions as to how the functions of government might be better and more economically performed. There have been released to the press recently two or three programs purporting to show Uncle Sam how he might do his job better by moving the bureaus and departments around and redesigning our "in-Washington" structure. No one can be more anxious to have coordination accomplished than those who have been in the Government service, and struggled with the intricacies of interdepartmental confusion, but I do want to say that while the outside volunteers are suggesting how this might best be done, there are expert forces at work within

the Government trying earnestly to solve the problem of coordination.

There is now in existence a National Resources Board and a National Resources Planning Committee. So far it is an unofficial agency, serving by virtue of executive prerogatives, but it is performing a great service in seeking to coordinate and plan the national project program. One of the first acts of this National Resources Planning Committee was to seek to set up State planning boards in the 48 States of the Union, through whose cooperation the Federal activities and State operation in the field of public works projects might be sanely coordinated. This network of State planning boards heading up in the National Planning Committee of the National Resources Board has the potentiality of providing the most direct means of eliminating the conspicuous conflicts which have existed both in the Federal bureaus and between the Federal Government and the States. It may well be considered as the clearing house for all Government projects and if made a permanent and official agency of government it might succeed in eliminating not only many of the trying interdepartmental conflicts but in so doing remove the necessity for the painful job of remodeling the entire departmental mechanism.

A recent memorandum from the President of the United States to the Secretary of the Interior indicates clearly the new method of operation through the National Resources Committee.

The memorandum reads as follows:

To Federal agencies concerned with projects or allotments for land drainage or water storage:

From investigations made by the National Resources Committee it appears that unnecessary waste and delay in the execution of land drainage and water storage projects result from the failure of Federal agencies to secure review of projects from all relevant points of view while the work is being planned, and that certain projects which are ill advised from public health, wildlife conservation, or other standpoints may be undertaken because such review is not made.

Please instruct appropriate officials of your agencies to submit a statement of impending programs involving land drainage or water storage to the National Resources Committee at regular intervals, in order that other agencies having an interest in the work may be informed by the committee of the programs well in advance of their initiation.

FRANKLIN D. ROOSEVELT.

The chairman of that National Resources Committee is with us this afternoon. His experience is wide, his understanding is thorough, and his sympathies are broad as this land. I commend you to the wisdom of Frederic A. Delano, who will now speak to you. [Applause.]

REMARKS OF HON. FREDERIC A. DELANO

Mr. FREDERIC A. DELANO. Sr. Zinser, Mr. Darling, ladies and gentlemen: Those in Washington who know me best know that I can't make a speech, and I had at least three friends who prepared speeches for me that I might deliver from here today. I felt that I couldn't get away with them so I am going to give you something very homely, some home stuff of my own.

I once read a definition of a gentleman which appeared to me very apropos. It said, "A gentleman is a man who knows everything about something, and something about everything." I wish I could

measure up to the first part of that. I can't. I come a little nearer to knowing something about everything, because I have a great interest in a great many subjects, including this subject that you have before you. I can't make any great contribution to it because there is hardly a person in this hall who doesn't know more about the subject than I do. But I wanted to assure you that I was greatly interested in helping you in the work you are trying to do.

For the National Resources Board, of which Mr. Darling has spoken, I am not the chairman. I am the vice chairman. The Secretary of the Interior is the chairman, and I am chairman of an advisory committee and vice chairman of the whole Board. This advisory committee attempts to make a study, an appraisement of different angles of the subject, and present its reports and recommendations to a committee of the Cabinet and, through that committee, to the President.

The National Resources Committee has recognized the grave importance of the conservation of wildlife as shown in its work; first, in the report of the Resources Board of December 1, 1934, a little more than a year ago, under the land-committee section, there is included a statement prepared in collaboration with the Biological Survey, and it makes recommendations for additional refuges and for coordination of wildlife-management policies.

Second, in the pollution report the water committee, through a special subcommittee, has issued a report on the control of stream pollution. On this committee representatives of the Bureau of Fisheries and the Biological Survey participated.

Third, coordination of drainage policies. At the suggestion of Secretary Wallace the water committee set up a special subcommittee on drainage policies which has very recently submitted a report to the President recommending procedure to avoid future conflicts among the agricultural, health, and wildlife interests in connection with the drainage projects. It is in response to that that the memorandum of the President just read to you was made.

Fourth, a supplementary land report, on wildlife conservation, prepared in connection with the original report of December 1934, has just come off the press. This has been assembled and printed through the cooperation of the Biological Survey. That is in my hands. It is a 24-page report which is ready for distribution now.

Fifth, the recreation committee; in order to promote a better understanding among the various agencies having jurisdiction over wilderness and wild areas of land, the land committee has set up a recreation subcommittee on which the Park Service, the Biological Survey, the Grazing Division, the Forest Service, and the Indian Bureau are represented. This committee is engaged in an effort to agree on terminology, describing the areas of land devoted to recreation and wildlife preservation.

The State planning boards, of which Mr. Darling spoke: There are now 46 of them. Some 12 of them are boards appointed by the Governor, the others are appointed by the State legislatures and approved by the Governors. They are almost all working on wildlife conservation problems, and many of them have special land committees giving particular attention to these subjects.

The National Resources Committee is available as an agency from all departmental organizations to further coordination among bu-

reaus interested in conservation and development of our wildlife and wildlife resources. Through its coordination committees on land, on water, and so forth, it provides a common meeting ground or clearing house for the development of management policy. The bills for the permanent establishment of the work of the National Resources Committee are pending in Congress. I say this because you may not all know that this National Resources Committee work is really being done by a part-time group of men, several of them men who carry a heavy responsibility in other parts of the country—college professors and others—and we are, to use a slang expression, pinch-hitting until a permanent committee is appointed.

Now, a word about cooperation and coordination. I sometimes think that these words get used so often that you must all be very sick of them. I sometimes get tired of them myself, but I am compelled to use them very often because there do not seem to be any other words in the language that mean the same thing. Of course we might say team play, which college boys know something about, explains it, but I have lived here in Washington over 21 years, have been at times rather closely affiliated with Government bureaus, and I am impressed with the fact that many bureaus of the Government very ably and very honestly conducted are working sometimes in a sort of vacuum entirely separate from other bureaus that are doing similar things. There should be some sort of scheme for bringing those different groups together, not in order to abolish any of them or put them out of business, but in order that each may know something of the work the other is doing, and may make that work more efficient.

If I wanted to take up some of your time I could tell you a good many varying instances of where there is a failure of one bureau or department or division of the Government to understand another section of the problem which, if they did understand, they could advance very much. But I dare say you know that of your own experience.

One thing I want to say in closing. There was handed to me just as I was leaving the office a letter from one of your number who asked me to stress the importance of the conservation of fur-bearing animals. Well, that is a subject that I don't begin to know as much of as many of you here, but I did hear a little story the other day that impressed me very much, of how, some 4 or 5 years ago, one of the game commissioners had placed some beaver in some of their streams, and inside of 3 years there came little fur-bearing animals that they did not bring in. They had never seen them there before, but along came the marten and the mink and two or three others. So that just shows that if you will help nature a little bit, nature will do the rest. [Applause.]

Chairman ZINSER. I am going to introduce to you Mr. William L. Finley, a great friend of the animals. He is going to have a little talk on his animals. [Applause.]

ADDRESS OF MR. WM. L. FINLEY

Mr. WILLIAM L. FINLEY, Portland, Oreg. (Speaking with motion pictures): Ladies and gentlemen, one of the greatest expeditions ever recorded in this country was that of Lewis and Clark in 1804.

A little later William Cullen Bryant wrote Thanatopsis, and in it he used the words "where rolls the Oregon", which is the title of my first reel.

The theme this afternoon is a great wilderness area, or was a great wilderness area, but you can see very quickly that there have been many changes, for very fine roads have been built from one end of the country to the other. Roads were formerly more for transportation, perhaps, but today they are built, it seems to me, largely from a standpoint of beauty and getting people out into the country. Five million dollars are now being spent putting bridges across these streams along the Oregon coast.

We have no difficulty in conserving wildlife along the coast. Huge sea lions come right down below the roadside. Nobody seems to bother them. If these huge creatures of the sea were formerly land animals, they have lost the use of feet and legs. They now have just fin feet, or flippers. An old bull will weigh a thousand pounds or more. He is called a bull, a female is called a cow, and the young a pup. It is a rather mixed nomenclature.

A common bird along the shore line is the gull, always looking for a hand-out, and it is very interesting to see how the children and the people all along the shore are always making friends with the gulls.

You can't see what is on these great rocks off the Oregon coast, perhaps, or any other coast line, until you get out and climb around. As I said before, we have had no difficulty with regard to the conservation of birds like gulls, murres, cormorants or, as shown here, the sea parrot, or tufted puffin, a bird that burrows underground like a squirrel.

From tide line to pinnacle every available sticking place is occupied by murres. They make no sign of nest—just a single, pear-shaped egg on a rock, and either male or female has to literally stay at home to keep the egg from rolling off and dropping into the ocean.

Here again: Numbers that are really the numbers of the sea! No question in regard to conservation of birds like these, because they are so numerous, very like, in that regard, some of our song birds. But there are other species, of course, that need protection.

The California murres crowd so close together you might think nesting is communal. You can pick up 500 eggs and no 2 are alike. This wide variation in coloring of the eggs perhaps enables one bird to know its own egg from that of its neighbor.

Now follow on down the coast line hundreds of miles, through beautiful scenes, up over the Coast Range Mountains to one of our greatest national parks, Crater Lake. It was a very fortunate step in our country years ago that established these areas of national parks. Here a great mountain lifted up, perhaps, 17,000 feet high. Later it erupted, literally blew itself inside out and then sank, and then this marvelously blue water appeared. All around the border, of course, the bank is from 1,000 to 2,000 feet high. Out in the center is Wizard Island, perhaps one of the original old craters.

All along this great Cascade Range, up to the Columbia River, we find snow-capped mountains and extensive forests. To me the Columbia River is one of the most remarkable of all streams in the world, for certain reasons that I shall give you.

Of course, they have very fine highways along the north and south banks. Some people object, of course, if too many roads are built. But with paved roads people can get out and see things they could not otherwise reach. We do insist that certain areas be kept as wilderness areas, where there should be no roads.

Here is a great river, great from the standpoint of commerce, great from the standpoint of producing a good food supply for our people, and great, also, some people think, for the production of power.

Here is where we have some difficulty, one industry destroying another industry, and that is the reason we have to be on the lookout.

Down the mouth of the Columbia early in the spring the Chinook salmon come in. They are caught in a variety of ways—a long seine stretched out in a half-mile area of water, then hauled in, sometimes with the use of horses, sometimes by donkey engines. Sometimes they have a good catch, sometimes the catch is not very successful, but in the whole this is a very remarkable place for seining.

They catch salmon by the use of gill nets also, and also by fish traps. This is an old skate that happened to be caught at the time.

A fish trap, as you know, is a stationary plant with piles and fencing wire stretching out on both sides so the fish are led on in through a little doorway, as it were, and then into the pot of the trap, and here they are, brailing out fish from the pot of the trap.

Here is the one thing that should be considered. We should not forget that thousands of people make money or live from the use of salmon and from catching them in this way, which you may think is a wholesale manner, but traps can be controlled and governed, so there is a crop not only this year but in other years.

Now let's come back to the real need. These fish come in to the Columbia and they much reach the headwaters. Some of them seek the side streams. In cases of this kind the people who are interested in the production of power have built a dam.

There is a fish ladder. Salmon are supposed to go up the steps. The way it is built makes it useless. I don't know why, but for some reason those salmon come up and they strive to climb that ladder, and, out of 50, about one is able to make this very difficult jump, and then a big shoot to get over.

The question is of why in the world one industry, for the production of power, is allowed to destroy another industry. That shows the necessity for an organization to bring a study of these things about.

Thirty-one million dollars are being spent in building this dam on the Columbia River at Bonneville. They are digging into the very heart of the earth to make the foundations. There are two channels, a south channel and a north channel. Fortunately, that dam is to be not more than 51 feet in high water, and about 71 feet in low water.

We have had a great deal of difficulty in getting enough money to build, or rather, have installed, four different fishways. We must have these gravity fishways, or fish ladders, in order to permit these salmon to go on upstream to the headwaters where they have a

chance to spawn. This is very simple, one pool above another, just a jump of two or three feet. Any salmon can leap that, and up to the next and the next. The eels, or rather, the lampreys, really don't need a ladder. They just suck their way up over the rocks, those very smooth rocks, and get on above without any difficulty.

But just bear in mind what will happen if you are going to build more dams and use a river like the Columbia River for power. It is the greatest salmon stream in the world, producing more salmon today, and it has produced more, than any other stream in the world. This industry, bringing in 10 to 12 million dollars annually, supports thousands of families. You might say it is an industry worth $200,000,000, because it produces 10 or 12 million annually, 5 or 6 percent. Now listen: If you destroy that gift of nature, it seems to me a great mistake.

The Indians have tribal fishing rights at Celilo on the Columbia. When the salmon come in, of course the Indians of eastern Oregon and Washington come to fish. You know, when Lewis and Clark came down this river they sat here on the rocks and ate salmon with the Indians. And, you know, they fish today very much as they fished a long, long time ago. It is a sort of sportsmen's way of getting a living. Sometimes they use these little dip nets, as you see. They have to literally catch the salmon on the fly as they leap to get above the rapids.

Here is a question. You might not think the salmon can find their way up over a great swift current and a lot of water, as you see here, but they do. They fight, and finally get on up and go on to the headwaters. The Indians fish here during certain seasons and they use these fish almost entirely for drying and for winter food supplies.

There are certain places, of course, where it is rather difficult to catch salmon. The most dangerous places are where they get the best fishing. Three Indians lost their lives last summer, and nearly every year one or two slip on the very smooth rocks and, of course, that is the end.

They fish, sometimes, in this way, gigging salmon, with a hook on the end of a long pole. They literally feel the salmon way under water, and pull just at the right time. It takes an expert to land one. An Indian wears very few clothes. He just drops them and goes across hanging to a rope, where he can get better fishing on the other side, and then, after a day's work, he comes back bringing his fish.

Of course, you might say that even if the salmon runs are destroyed the Indians could live on something else. You might say that even though the salmon of the Columbia River were destroyed many families could find another way of making their living, but the thing that strikes me very queerly is that businessmen, the men of the chamber of commerce—here you will see, in this picture, that when an Indian hooks a salmon the hook comes loose from the pole and is attached to a rope so he can pull the salmon up more easily—don't study the results. It costs $50,000,000 to put in the dam, and it will take 50 years to pay this back. At the same time you may destroy this valuable gift of nature, which is not encumbered with debt!

I am not fighting against industry. The thing I do insist upon, and, as a citizen, I think you would do the same, is to consider these

things in advance. We have lots of streams. Some of them are good for power purposes, some are suitable for salmon, the question is whether we should use our best salmon streams for the production of power.

An Indian's life, of course, is very different from ours. When he fishes all day then he thinks that the wife ought to carry home the supply of fish, and she does. She is the one, of course, to also clean the fish and dry it for the winter's food supply.

REEL II. THE FORESTS

To me the forests of the country are of such vital importance, not only from the standpoint of the lumber in the tree but from the fact that the forests mother the water supply of the country. As the rain comes it seeps into the sponge of the forest floor and on down in this way to prevent the erosion of the soil. The forests have a variety of uses, as you know, and it is in these homes where our big game animals live.

The greatest menace, the one that has not been conquered yet, is the fire that almost every summer sweeps through this vast area in the Northwest and takes an untold amount of timber, and then, as a rule, after the fire you have nothing but a lot of stump lots, eventually. Then comes the erosion of the soil; the rain sweeps the soil down into a little gully and carries it off to bigger streams. And what do you have? Not only loss of the soil but, as here, erosion, and you have those terrible floods that, every year, cause great damage in places where people live, and even in the cities that are along some of these stream beds. Then, in the summer, when you need the water, when you should have the water for irrigation lower down—just a dry stream bed!

In our country we are thinking in millions and billions. The trouble is, the land promoter has a bit too much to say. He wants to spend $20,000,000 building a great dam to back up the water and create a big water supply. That may be all right. The great trouble is, you can't have a big water supply to water the fields unless you have hundreds and thousands of little water supplies, and here is where we have utterly neglected the natural building of wealth.

The beaver, which previous speakers mentioned, builds a dam for one purpose, to store up the water to make a house out in the center of a pond. I might just as well tell you in the beginning that a beaver hide is worth $10 or $12, maybe, but a live beaver in our country is worth $300. If a dam doesn't hold water, he mends it. The beaver in the background slaps his tail on the water because he is just a bit alarmed. It is a signal for the other beaver to keep hidden, but this fellow knew the dam needed mending, so he went over and cut that branch and he brought it down. I want you to watch how he comes in with the flow of the water, pushes that stick or limb down until the butt catches in the mud, and then gradually cuts off the smaller branches, making a sort of network. Later on he piles in the mud, and in a little while he has that dam mended.

A long time ago, when the mountains were lifted up and the rains came, the floods swept across the valley into the sea. We lost much of our topsoil. Then came the beaver. He built that little dam. When the flood came it stopped temporarily the flow of the water.

The silt settled to the bottom, gradually, in that way, building those ponds into meadows, little meadows, then into big meadows, then into valleys—all the time more dams storing up water.

From the Atlantic to the Pacific, if you go back through the history of the country, you will find that all our best lands really started by the work of the beaver in the beginning; that is, in all our western country and even in the mountainous areas of the East. You know, we have forgotten the early production of wealth that the beaver brought to this country.

Now, where you have an irrigated country, a beaver can't look at a ditch without wanting to dam it. Of course a fellow who is using the water to irrigate doesn't like that, so he used to kill the beaver. Well, we have a different plan now. I think we have a great system in the State of Oregon, where we have complete cooperation, among the Forest Service, the State game officials, and the Bureau of Biological Survey. Wherever a beaver is doing damage that beaver is live trapped. He is not killed. They don't give a man a chance to kill a beaver. Because why?

Because in all those western mountains you will find, way up in the tops, under the high points and ridges, maybe a little spring, a beginning of water. If that is not stored up, of course it disappears, and a little further down you have another barren stream except during the spring run-off.

By taking these beaver—it is a very simple process—up into the mountains and turning them loose, immediately they begin building these dams. Just think, for a moment, of what that means. It means that water is stored up for irrigation lower down. It means that in this dry area you have grass growing for pasteuring stock along this long, dry stream bed for 20 miles. It means you have areas for trout. You have regions for recreational purposes. The situation changed from the time when stock people in that part of the country had to dig wells and pump water so that the stock could live in that section.

If I had time I could give you specific areas where beaver trappers went in—for instance, in Silver Creek, in southeastern Oregon—and killed 500 to 600 beavers. That meant $5,000 or $6,000, maybe. Then the dams began to go to pieces, the water users began to sweep off downstream, and inside of a few years, instead of producing 15,000 tons of forage, as had been measured by the Forest Service—and 15,000 tons of forage means you can carry many livestock in that area—it was reduced to about 200 to 300 tons. The fish were destroyed, the recreational values were lost, and while the trappers gained in 1 year $5,000 to $6,000 the ranchers had a continuous loss, and have had every year since that time, of anywhere from $30,000 to $50,000.

These dry stream beds are typical. Oh, there are hundreds and thousands all through the western country. I am not talking about the East. The Forest Service tried making check dams. I looked at them; we smiled. I don't think they amounted to much, but it was just a try. It didn't amount to much because nobody was on the job to keep them in good condition. When the water came they may have stopped some erosion of the soil, but in the case of the beaver they are on the job all the time, and you don't pay them anything.

A beaver is an animal that is very easily tamed. In 20 minutes this fellow was sitting around combing his hair. You can hold him. You can get a good idea here of what a beaver looks like. His little front paws are like your hands. He uses them in the same way, to carry things—to hold mud against his chest. His hind feet, of course, are webbed, like the foot of a duck. His tail, flat, is not used to make mud pies. It has a definite purpose, for service as a rudder, to guide him in the water, and also to slap on the surface in the time of danger, to warn his companions.

Here is what has actually been done by the Forest Service, and, as I said, the State game department and the Biological Survey. They put these beaver up where there was no water in the summer time. They gradually built ponds.

Now, what is the difference? In one case you have a great reservoir with thousands of acre-feet, and you also have a $90 mortgage on every acre of land. In the second case you have thousands of little reservoirs with an acre-foot in each and no big debt for dams. In some ways the second plan is more valuable, because in these areas people can live, people can support themselves. They have cattle. You can get fish out of these ponds and, as has been said by the previous speaker, fur-bearing animals and ducks. My heavens, if we only could get people to know the value of the beaver, the value of building wealth by inexpensive methods.

This is a large beaver house, shown here.

I told this, I think, a year or so ago in Minneapolis. Some fellow there said, "The beaver is no account at all in Minnesota." I am not talking from Minneapolis' standpoint; I am talking from the standpoint of this great country in the West where we need water and where we have to have water.

Go back into these areas where the beaver have been abundant, where they have never been trapped, where you have fine streams, and there you find plenty of game. You think this is not of value. You think it is not of value to have people come clear across the country and go out into the woods. See this wonderful timber—it is worth more than simply the amount of lumber in the tree.

We were camping, mind you, at this time, on the south side of Rainier. We had a little cupboard. We forgot to lock the door when we left. Pretty soon I noticed some chipmunks come in. They had seen where the horses had dropped some nuts, as they thought—oats. They also came in and took all the crackers out of the cupboard, and the few nuts that we had. Fortunately I had some in my dunnage bag. I got a nut and tied one to a string, and in a little while that fellow, wild as the wildest thing in the mountains, came up. He was pretty tame. He didn't know that nuts grew in the high mountains.

Then I hung some several inches above the ground. Chippie came out and saw the air filled with nuts, and he was so excited he wanted to get them all at once. He knew more than some people about storing up against the days of winter.

We had a rope across between two trees, and I hung some nuts on strings and tied the strings to that rope. I thought the chipmunk would go out on the rope, down the string to the nut, and I would have him in a box. But he didn't. He pulled the nut up hand over hand, then ran away with it, but it jerked out of his mouth. Here

he had to come back and haul it up again. Inside of about an hour those chipmunks had learned that nuts grew on strings, and wherever they saw a string they began pulling it in. Animals are intelligent; they are more intelligent than we give them credit for being.

This is something that you may laugh at. Children laugh at it, too. The first time I ever showed it was at a chamber of commerce meeting, where businessmen howled at the little animal actors, and I was surprised. Well, it is just a part of that great outdoors, and when I speak I mean everything out of doors. Some people like angling. We should have angling—fish in the stream. Some people like to get out just to cook in the open air, because of the better appetite in the open, and to sleep under the stars.

I sometimes wonder whether the American people realize, whether they can look forward to seeing the development of some of these simple methods of producing wealth, whether they can see the value of getting people out into the open. The more we can get people interested, the more we can get them out, the sooner we will solve our problems, provided the organizations around here don't get to quibbling and quarreling over a lot of things that don't amount to much when there are so many big things to be done.

There isn't an organization in the country that can kick against prevention of pollution of streams. That ought to be stopped—and all these other things.

Fortunately, we have our national parks. We have these other problems—summer feeding grounds and winter feeding grounds—to conserve big game animals like elk or wapati. They formerly lived from the Atlantic to the Pacific, but they are gone from many places. We must conserve a few of these areas in this wide country of ours—a few set aside solely for conservation. [Applause.]

REEL III. PASSING OF THE MARSHLANDS

We started in photographing a good many years ago. In 1905 we went down here to Lower Klamath Lake, in southern Oregon and northern California. This is just an open channel, the water flowing in or out from Klamath River, kept the lake at the same level as the river. Lower Klamath Lake lies partly in Oregon, partly in California. Around the border for miles and miles the tules grow, and here is where birds live—white pelicans and a great variety of others.

Lower Klamath Lake was a wide shallow lake surrounded by wide marshlands. This is a typical area where the great blue herons were nesting. In some nests eggs were hatching. When a chick gets his bill through in one place he keeps struggling and striving until he gets the end of the egg open. When he is born he is wet and weak, but he will blossom out in a little while. Nearby was another nest where the young were about, I should say, 8 to 10 or even 12 days old.

You know, at that time, in 1905, we considered Lower Klamath Lake one of the greatest wild-fowl refuges in the country, greatest because of the actual number of birds it produced all around the border.

Of course, sportsmen might say that the cormorant is a fish-eating bird. It eats the trash fish that people do not use.

Here is a great economic problem. Gulls live on grasshoppers, and when they destroyed these great areas in Lower Klamath Lake immediately the farmers began spending hundreds of thousands of dollars to try to keep in check the grasshopper pests after they had destroyed the gulls. They didn't look; they didn't think about that beforehand. Go over to Salt Lake City and you will see a great monument erected to the memory of the gull because the gulls saved the crops of the Mormons.

You can recognize the Wilson snipe or jacksnipe, I suppose. Here we put up a little blind. I went in and sat down quietly. This game bird is naturally wild, I suppose because it had been hunted for so-long. Mother came in slowly. She heard a sound; she couldn't quite get over that. After a while, through the grasses, turning around one time as if she pretended to be on a nest that wasn't a nest, finally she settled down on her eggs, to incubate them.

I always like to keep track of a bird home and see if we can get a life history of the family. We couldn't wait till the eggs hatched. But it just happened, about 10 days later, we came back to this spot. I saw the eggs had all hatched—four of them. I started hunting out in the marsh. It was like hunting for a needle in a haystack. Finally I found one little jacksnipe. I brought him back. He, of course, didn't like the big-eyed monster, the camera. He was afraid; he tried to get away, but finally, after a little patience, he stood up like a real fellow and had his picture taken, and then he went off into the marsh, where I am sure he grew up to be a big bird later on.

The thing I want to call your attention to is this: This was given to the Government by the States of California and Oregon, and turned over to the Reclamation Service. The Reclamation Service spent $281,000, and they saw that the whole area was alkali, of no use, so what did they do? Well, promoters came along, offered to pay the Reclamation Service that $281,000. Instead of saving this area for waterfowl, the reservation was turned over to promoters.

This is what happened. The channel was dammed from the river to the lake and the lake dried up. A fire started in the dry tules that not only swept for days, weeks, and months; it burned for years, because down through the depth of from 4 to 6 feet in the peat that fire kept burning, and you can see it burning sometimes today.

And what have you got? You had a great reservation, with untold numbers of birds. Now you have, not agricultural land, but a lot of alkali soil—a desert.

There is a most significant thing. If we had been awake years ago, if we had had an organization of this kind, if we had been ready to meet the situation, this would not have happened. It is so tied up with the power interests and other contracts.

I was talking with "Ding" Darling. I don't know whether the Lower Klamath will ever be restored. Maybe it will and maybe it won't. That is what it looks like today, good for nothing.

Now, just jump over about 60 or 70 miles; this is 1912, and here is Clear Lake, with its swan, or western grebes—beautiful birds. They used to shoot these birds for millinery purposes. They made turbans and capes out of that very fine plumage of the breast. These birds build floating platforms or rafts for the nests. The Forster's tern and grebes nest together in colonies. The bird in the foreground is a Forster tern.

The grebes go through some rather interesting performances, nuptial antics, bobbing back and forth. Sometimes they will rise right on the surface of the water and shoot along for 50 feet.

Speaking from the sportsmen's standpoint, it is a loss when the goose nests are destroyed. A goose is one of the best mothers in the world. This, of course, is early in the spring, the beginning of April. The next day we had a storm, a snowstorm. Mother knew how to care for her young. They crawled under her and were protected until the snow disappeared, and then they were ready to climb out on the hurricane deck, and mother and father led them off into the marsh. They stay together until they are nearly half grown, then one family joins with another family, and so on. A little later on they gather into larger groups, and then comes the time when you see the wedges of geese moving on south. Those wedges of geese are some of the most inspiring sights of Nature. I am not speaking from a sportsman's standpoint, entirely.

Here was a situation, also, where the Reclamation Service controlled this area. Unfortunately there was no interest at this time in the protections of birds on Clear Lake. The Reclamation Service seemed to have one viewpoint, you might say, and that was to produce agricultural land and get water on it—more farms, more produce. They did not seem to feel that bird life also was of any value. You know it took quite a number of years before they changed their point of view. The Reclamation Service has come around to where they are recognizing bird life. This great area was nearly destroyed partly by drying up a large portion of the lake and partly by leasing our reservation for grazing stock.

I think this is not to be kept from the public, but the Reclamation Service has entered into a contract, I understand, with the Biological Survey so that waterfowl on these areas are protected. Here was the trouble: They sold a big part of that water to the power interests, and while the whole area did not dry up, the lake was reduced to about one-fourth its natural size. A year ago, when we flew up over, this is what we saw. It looks as barren as a desert. The lake, 10 to 12 miles long, is now a very small area with all the grass destroyed around the border. You will note that little stream. That little dike or ditch is the place that led the water out of the like, way over there. It finally ended 6 miles back from where the original dam was.

Mind you, they sold that water, not for irrigation but for power. They should have sold just the surplus and kept the lake intact. Then they leased the land to sheep and cattle men, and immediately all the natural plant life was destroyed in this area; just a small piece was left for birds, where the Biological Survey built a fence. At one time sheep and cattle actually went into the bird colonies, tramping on the eggs and young birds. This gull colony was 6 miles back from water. I don't know whether they will ever survive, because of coyotes.

Now we are over in southeastern Oregon at Molheur Lake. 'Way back in an early day this is what it looked like—another very fine series of tule islands, open water, lots of food. You know, there were none of these American egrets nesting there in 1908 because

B38375

A, Young Richardson's grouse in tree at Box Creek, Teton County Wyo (Biological Survey photo.)

B4241M

B, Wayne's clapper rail entering nest. (Biological Survey photo.)

39718A

A, Wild turkeys feeding in the Wichita Mountains Wildlife Refuge, Okla. (Forest Service photo.)

B25530

B, Quail feeding on grain scattered on the ground after a snowfall. (Biological Survey photo.)

they had all keen killed by the plume hunters. A little later on some of them came back; then they were driven out when the lake bed dried up.

This lake contained, of course, large colonies of pelicans and cormorants and different kinds of waterfowl—three kinds of terns, the Forster, the Caspian, and the black; also a great many ducks and geese. More geese were produced in this area than in any other section of the United States—Canada geese. I counted, I remember, 1,500 in one little area. Most of the birds were pretty well grown.

Also along the border were the ducks—the mallards, the pintails, the redheads, and the ruddies, and especially the cinnamon teal and others.

Molheur Lake did not belong to the Reclamation Service. I am not going to blame them for the destruction of this lake. The water supply of Molheur Lake came from Silvies River on the north and the Donner und Blitzen River to the south. The water was used more and more to irrigate sagebrush land and the lake dried up. Then here is what we have left—just a dust storm.

Here, I think, the Biological Survey was very much at fault. They had an utterly spineless policy for years in not keeping the squatters out. When the lake finally dried up we found buffalo heads and skulls, and we never knew that buffalo originally lived in this area. We have no record of the live animals, however, during the history of man.

When the squatters moved in, they actually took away from the Biological Survey this land that it had been guarding for years.

Of course, I might be criticized for saying this. It was an involved land problem. Last year, or rather the year before that, the squatters plowed up the lake bed and they did get crops out of some of this area. The following pictures show a remarkable comparison. One was taken exactly where the next picture was taken with 20 years intervening. Marshes filled with waterfowl in 1912 and a dry desert in 1932, that one 'way back, as I recall, in either '12 or '15.

REEL IV. WATERFOWL

It looks like rather a pessimistic picture. It was pessimistic until 2 years ago, as you know. Then we got water turned back into this area—a year ago last fall, and I can never forget what Mr. Darling and the others have done in helping restore this area. This is a C. C. C. camp. The idea was that we would have only a limited amount of water, perhaps. They had to buy the whole Blitzen Valley and watershed, 62 or 63 thousand acres, as I recall, for the chance of restoring this area. Here is the old farmhouse where the warden lived for years.

You know, they had to literally flood some of the squatters out. That may not have been right, but it was the simplest way the Government could get possession again.

A year ago you could drive a car over the whole lake bed but you couldn't jump these ditches now. Then the ducks and the geese came back, and you know, they had the greatest conference. It was something a great deal like I hope this conference will be. They

assembled for the first time in many years, thousands of them—and mind you, there were only five or six thousand acres flooded at this time.

Jewett, the superintendent, just wrote me a day or so ago, and he said they had had a great snowfall in the Steins Mountains and perhaps Malheur Lake will fill up to a large extent.

This is part of the area purchased. The Blitzen Valley is straight south of Malheur Lake, 2 to 5 miles wide. As the lake dried up, naturally the ducks came on up into the valley. Fortunately this valley existed was available. Out through these marshes the water birds live.

A duck, when she goes away, of course, always covers her eggs, partly to keep them warm, partly to hide them from enemies. We set up a blind, watched to see whether that teal would return. She did return, very slowly. I wanted to see how she pushed the cover back. Finally she settled down on her eggs.

We must have these breeding areas for ducks, geese, and wading birds if they are to survive.

We thought the American egret was gone forever. Fortunately a few of them moved up into the willows of Blitzen Valley, after Malheur Lake dried up, and here they are still living. I hope eventually they will return to the bed of Malheur Lake when the water is restored. There are 5 or 6 thousand acres at the present time, but originally there were about 42 or 43 thousand acres.

There are Mallards; and a Wilson Phalarope.

When we speak of the outdoor resources of the country we do not speak of game only. We mean all our outdoor resources; a bird that is beautiful in plumage is just as much a part of this great country as the bird that is hunted and used for food. So I hope we will always have some of these white herons and a place where they may live, because, as I said before, there are just a few pairs remaining out in that southern Oregon country.

In the open field is where the long-billed curlew lives. I often wonder how in the world they exist, living right out in the open, where you might say anybody could see the bird in the nest. If you approach near, the male flies at you just as it does when a coyote, or a hawk come near. The male is generally out trying to drive so-called enemies away. When the mother once settles upon her nest you may approach within 5 or 6 feet, and she is so like the surroundings that, 9 times out of 10, you would never see her.

We wanted to get a picture of the young long-billed curlews. They do not have long bills in the beginning. We didn't want to take these eggs. We couldn't wait until they hatched. When we got back to Burns, Dr. Hibbard brought over an old bucket. He had been out and found a nest with three curlew eggs, and had taken them and set them under a bantam hen in the bucket. "I am very sure if you keep this hen you will have some curlew chicks later on," he said.

Mind you, we were traveling about a hundred miles a day in rough country out through the sagebrush and rock. We would take the mother out of the bucket to rest her and she would go back. Eight days later we did have three little curlews, and we had a chance to really see what a baby curlew looked like and to get these motion pictures of them.

The curlews are like golden plover and others—that have disappeared quite rapidly, and unless we can have areas for their protection they are very likely to continue to disappear. We have the avocet, another bird with a long bill, but the bill turns up a bit, as you can see. They go along, swinging from side to side in the water gathering food. Here is the nest, right in the open. The birds were on the eggs, not so much to keep them warm as to keep them cool, because the weather was hot.

One bird stayed on the eggs from 15 to 17 minutes. We could tell male from female; you can't because the coloring doesn't quite show. The female was on for from 15 to 17 minutes. In would slowly walk the male, and they would exchange places. She would go out, feed a bit, perhaps stay in the shade, and then come back in about that same time. There was perfectly divided duties between the male and the female, and rather unusual, I thought, in that they were so regular in staying on the eggs.

Here, again, we happened to get a picture of a little baby avocet.

A baby robin, of course, has to stay in the nest for 10 days or maybe 2 weeks. The young are born helpless and blind, but the little avocet is able to move out the second day and begin hunting a living of his own. We found a great variety of birds—ducks, geese, wading birds, as well as song birds; marsh wrens, song sparrows, and others nesting in these marshes.

Fortunately we got a chance picture of a ruddy duck one day. The little fellows were imitating the parents, with tails straight up, bobbing as they dove. There are quite a number of ruddy ducks all through this area, from Malheur Lake to the Klamath and Clear Lake country.

I have been surprised to find that the redhead duck is perhaps more abundant in parts of Southern Oregon than almost any other duck except the mallard and the pintail, and they have good-sized families.

The Government has been for a number of years carrying on a very important experiment, I think. It has been done in other parts of the country. They built a sort of trap for the birds to be enticed into, where they are caught. This work of banding ducks is being carried on by some of the C. C. C. boys on the bed of Malheur Lake. We were surprised to find how interested they were.

Of course, the banding records are carefully kept. These birds migrate. Some of them are killed by hunters and the bands returned. They had a surprisingly large return of bands from different parts, largely from California. The birds from Montana, Oregon, and Washington go down into the bay region, or into the waters of the San Joaquin and the Sacramento. Banding is important in getting scientific data and establishing the migration routes of birds.

You have of course heard that it is very necessary that, besides breeding and resting grounds, we have areas where birds are protected in the wintertime, and where they are fed. One of the most interesting places is at Lake Merritt, Oakland, Calif. Perhaps you have seen this place. The city feeds about two sacks of grain daily. I have seen the ducks here many times. Along the bay they are the wildest of wild things. You can't get within several hundred yards of them. Yet they will come swinging around above this lake and drop down, and within 20 minutes you can get up within a few feet of them. You think birds are not wise! You don't even have to

put up a sign. All you have to do is to give them a protected area in wintertime.

We have always been interested in the bird as an individuality. Here again I wish to say there is more intelligence in the wild bird and mammal than we give him credit for. This is a little mallard brought to us late in the season. Mrs. Finley raised him in the study while I was East. In the fall he grew up. The gardner fed him worms; the dog used to come in and poke his nose around, and when I got back in the springtime this full-grown drake mallard was following everybody around. He had become part of the family, following one around just as if he had been a stray dog.

He followed the gardener, of course, because the gardener would uncover a worm or two, and when the gardener wasn't around this old drake took to the dog. Well, that was a strange companionship. He would follow the dog around wherever the dog went, always trying to pull the dog's tail or perhaps nip an ear. I have never seen such a companionship. That was all a one-sided love. The dog didn't care anything for the duck, I know very well. That dog would have eaten the duck if it had not known that the duck was part of the family, because when the dog wanted to sleep the duck was always around pulling his ears and tail, bothering him all the time.

Sometimes you would hear the dog yell, "Hey, come on out here and get rid of this darned duck!"

We have had other pets about us. I was surprised at a quail—a California quail—how it lived with us one winter and then, instead of going away in the springtime, would follow us around just like a dog. Of course we were high up, but our shoes were down near the ground, and for some reason the quail took to shoes, especially tan shoes. It liked color. It loved to court tan shoes and fight black shoes. I, of course, couldn't quite explain it.

That dog didn't have any use for birds at first, but after a short time he got used to them and, as I said before, he understood that birds were part of the family.

You know, as it finally turned out, that quail lived with us for 7½ years. The quail stuck with the dog because the dog used to keep the stray cats away, so the dog was a protection to the quail.

REEL V. PUBLIC DOMAIN

Now, the public domain is to me one of the greatest problems of the West. You go out through that country now and it seems like a wreck. In it there are these terrific windstorms because, as you know, it has been overgrazed year-in and year-out. The Government owns 160,000,000 acres, or something like that, and never, until a year ago, did the last Congress take possession of the public domain. Before that the invitation to all the alien sheep herders was "Come in; take everything you want."

When you use property in this way you know just what happens. The large stock owners bring in the alien sheep herders. They start them with a little flock of sheep. The sheep herder goes out; he doesn't stay in any place. He works lower down, or south, in the wintertime, and then in the summer he keeps working right on up

the mountains. Alien sheep herders own no land, pay no taxes, but live on the public land. They destroy some of our park-like and very beautiful areas. This is the Steins Mountain country, in southeastern Oregon.

We have to depend upon the water of this area as the supply for Malheur Lake. The land is overgrazed to such an extent the soil is eroded and park-like areas ruined. There is always competition for one sheep herder to get ahead of the other. I actually saw those sheep clear up, almost on the top of that mountain, in the end of May and the first of June. The grass was scarcely out of the ground. Of course the sheep literally nip the heart out of the native grasses and tramp the roots out.

Here, this is an actual homestead that had been taken up, 'way above timber line. All they wanted was to get possession of the water and turn it over to some big sheep and cattlemen. Why, this should have been in Government hands, this and many other areas, many years ago. But fortunately we headed off a few of these homesteads, although there are lots of others, of course, that were not headed off.

The Taylor Grazing Act was a wonderful law, because it took over public domain. We have some complaint, of course, if the land all goes to the stockmen.

I want to show you the sage grouse, because that is our game bird of the West, the biggest of all grouse that needs protection. We went early in the morning into this blind in an area of about 5 or 6 acres. These are cocks. They come together before daylight. As you can judge, they inflate an air sac on each side of the chest about the size of a baseball. They go along a few steps, plopping it up and down. I don't know whether to call this a dance or a strut. It is a sort of stag affair, because only the males are present. They get together here; there were 52 of them in that area of about 7 acres. Each has his own dancing place about 20 or 30 feet apart.

They go through this dance until just after the sun rises, and then they scatter out, away out into the sagebrush country, and then come back next morning. They do this for about a month in the early spring.

At the time these pictures were taken that performance had been very incorrectly described. This last picture was taken as early as 5:30 in the morning, just as the sun was rising. This is a bird of the public domain and a refuge should be created to prevent its extermination.

The public domain is not entirely useless, because it is good for grazing purposes, although it is not suitable for farming or raising grain.

We were looking in the ninety-odd corners of sage and sand for a baby antelope. Finally we found one. The first 12 days after the mother drops her young it plays 'possum. Speed has not come to his little legs yet; he can't run. He can't keep away from coyotes, bobcats, and other enemies, so he crouches, still as death, with not even the wink of an eye.

We took him to camp. He didn't take to new-fangled methods—to a bottle. We let him run off to get a little exercise. He ran off and,

when he dropped, he would remain exactly as he dropped. As I say, that is his way of playing 'possum.

It is a scentless breeze that blows across his little body for 10 to 12 days. There are many enemies in this country and many antelope are perhaps killed. After 10 or 12 days he would follow us about just like any dog.

Water holes are the vital things in the great part of this public domain. Without water wild animals and birds cannot live, therefore a water hole is worth a good deal. If they fall into private hands and are fenced, our antelope will disappear. A thousand acres of rocky sagebrush country is not worth much if there is no water.

In the study of predatory animals, the coyote is an interesting one. If anyone thinks that the Government will finally destroy the coyote you may be sure it will not, because it is too keen. This buck antelope was killed during the night. Evidently a bunch of 5 or 6 coyotes had caught this full-grown antelope and torn it to pieces. We saw five or six places where the coyotes were hunting together. These Federal hunters are very expert in hunting out the dens where coyotes live. I said there is no chance of exterminating these coyotes. You may have thought they lived back in the rocks or in a cave. This is typical of the way they live, digging back 15 or 20 feet like a big squirrel hole, and here they have their young. From 3,400 to 3,500 coyotes have been killed through eastern Oregon each year during the past 18 years, so they seem to hold their own, like the crow. That is one bird that will always survive, even though man starts to hunt it with dynamite and every other way.

There have been campaigns for killing coyotes with guns, traps, and poison. I have found these families seem to be growing larger, perhaps because the keener animals seem to survive. There were 10 pups in one of these dens; in two dens there were 14 pups.

Well, there are different questions that may come up. Arguments arise, of course. Coyotes are a natural check upon other animals, like squirrels and jackrabbits.

You know, to me those are most involved problems—those problems of nature. We need experts, and we need them to work for years and years until we finally get the solution.

I said before that a water hole is an important thing. If you let private owners fence these water holes your antelope is gone. It is an animal that is highly strung, easily upset. You can't raise it in captivity. It must have this wide open area. And why not? There are 180,000,000 acres of public domain owned by this Nation.

This was the first picture at the water hole, and, you see, they came in close. They immediately caught the sound of the camera, and away they went. Here, using the 6-inch lens, we got them a bit farther away.

One difficulty is that antelope are crowded out by sheep or cattle. Domestic stock graze over this whole area, and naturally around the water holes. The antelope had to go back 12 to sometimes 15 miles to get food. I was very much surprised to see a bunch of 16 or 17 antelope come in to water, with perhaps only three or four fawns, a great reduction of fawns for some reason. It seemed to me that they were not protected as they should be around this area, because

there has been no protection of the public domain from overgrazing by sheep.

You may think there are a lot of antelope here. At times you can count 3 or 4 hundred. They come in for miles and miles around to get water, and then they start for places to graze. That doesn't mean that there are thousands and thousands of antelope. We don't know how many there are. You have heard that the Government has established the Hart Mountain Antelope Range. One serious mistake in this is that antelope are limited to a minimum of 4,000. There are perhaps more than 4,000. Why should these be killed off?

The antelope are the swiftest of all wild animals of the continent, and one of my real sports—if you people like hunting—was trying to keep these animals in the lens while I was hanging on the auto. It was going 40 or 45 miles an hour. Occasionally we could get the animals going straight across this dry area, where there is no sagebrush growing. Generally, they would swing into the sage. Occasionally one would go straight across. When he came to the edge of the sage, away he would go and we would have to pull up on two wheels. They like to race, especially in a short race like this, where they can always get the better of a car.

Forty to forty-five miles an hour is nothing in this day and age, but it is quite swift for one of these wild animals. One day we chanced to get a doe going straight across, and it is pretty difficult, as you see, with such motion, to see how these antelope run, how the legs stretch out one moment and then double up, jack-knife, at another. I measured the tracks and found 18 or 20 feet at a jump.

This one will stop if you say the word, giving you an idea of how the legs double up one instant and stretch out the very next. Stopping a running antelope on the screen is done by printing a single picture of the motion picture for a distance of four feet.

We had real outdoor fun in chasing and getting pictures of these antelope.

You know, there are certain problems, like this Government domain; as Darling has said, like wildlife as a resource, that surely an organization of this kind can agree on, and forget a lot of the more petty things, where we disagree. The organizations, Government and State, I do think, are working far better together today than they were a few years ago, and through Mr. Darling's help we really have accomplished more in 2 years than I expected to see accomplished in 12 or 15 years. [Applause.]

Mr. DARLING. The paper which was to be read at this time by Mr. Lithgow Osborne will be delayed until tomorrow. He was delayed and could not get here. It will become the first feature on the program tomorrow morning. That is a little invasion of the organization date, but he has had a great deal of experience with organizations such as we are talking about. His paper contributes to that.

This morning I want to say that it was a very disheartening thing to have Senator Key Pittman come and deliver one of the most delightful and earnest contributions on conservation that I have ever heard from a public official, and there were about 25 people down here in front. It would be pleasant if we could call upon the

people to come at 9:30 in the morning and have a fairly good audience, and not have to repeat.

Tomorrow is going to be organization day. It may be an explosion, it may be a pleasant journey. But, at any rate, let's start early enough so that if we have to have a fight we can get it over before night.

We had some features here during the morning that we feel were very inspirational, and we are going to try to give you a sample of them, because you weren't here today. The junior chamber of commerce produced one of the high spots of the day. I am going to ask them to be on the program tomorrow, and then Mr. Lithgow Osborne, of New York, after which we will jump into the organization program.

(Announcements.)

(The meeting adjourned at 4:40 o'clock.)

WEDNESDAY MORNING SESSION, FEBRUARY 5, 1936

The conference was called to order at 9:45 o'clock by Mr. Seth Gordon.

Mr. SETH GORDON. So that all of you may understand how this part of the session is to be handled, let me say that when the President's committee assembled here in Washington, this conference committee appointed by the President, to agree upon a plan of action, selected an organization committee, and requested Hon. Jay N. Darling to take the chairmanship of that committee, so Mr. Darling is the presiding officer of the day. I need not further introduce him to you at this time. [Applause.]

(Mr. Jay N. Darling took the chair.)

REMARKS BY MR. JAY N. DARLING

Chairman DARLING. It is rather late to bid you good morning. I always thought that good conservationists got up earlier in the morning.

I am aware that there is a great deal of unjustified suspicion as to the motives back of this conference. It is being said that this is a Department of Agriculture convention; that it is a Department of the Interior set-up; or that the various factions existing among the sportsmen are trying to get control, and that there is something back of this gathering aside from the main objective; i. e., getting the conservationists together on a program. I want to wash my hands in public and pull up my sleeves and show you that I have nothing hidden about my person and that at least so far as your chairman of the day is concerned there are no hidden motives. [Applause.]

This job makes me think of nothing quite so much as how a mallard duck must feel going from the Canadian border down to the Gulf of Mexico, with every marsh full of guns and a shot taken at him at every point. It is my duty and privilege to attempt an amalgamation of all conservation factions into a national working unit or to outline a method which may accomplish that amalgamation.

I find that there is a tendency for people to interpret this conference in terms of benefit to their own particular interests. We must first get rid of that point of view in this discussion. We must get

rid of the effort to interpret the actions of this conference in terms of our own little region or own particular office or own department. If I can, and am allowed to stay on this platform, I shall try to resist every effort of any factional group to predominate or steal the show. We must have a combination of all conservation groups, and if we do not succeed in accomplishing a unification of our purposes, then I should say that the meeting would be a failure.

The momentum which has been created here by the common interest of all seems to me sufficient to carry us over any hazards that may arise. If we but remember that the main objective is so much greater than any little individual control, personal interest, or factional control, then we shall succeed.

We have been here now 2 days, and this is the beginning of the third day. Owing to the diversity of interests and the multiplicity of programs which have been going on simultaneously some of you have missed some splendid discussions. Yesterday morning Senator Key Pittman appeared here. It was one of the most inspiring—it was the grandest address that I have heard from any public official on conservation since my experience in this work—and an appreciative but small audience heard it. It was your great loss that more of you were not permitted to hear one of the best friends of wildlife in the United States Senate.

We also had a young man from the junior chamber of commerce, who spoke on the subject of Federation. The junior chamber of commerce came into this wildlife picture because they had no background of old jealousies, no background of having been for the duck regulations or against the duck regulations or otherwise contaminated with factional warfare. They as an organization had a great desire to be of service in the field of conservation. They offered their services in building up this conference. They have been the missionaries, the messengers to Garcia. They have gone into the hot spots in the States where conservationists were divided against themselves; they have done a tremendous job in welcoming all factions into this conference. They are the young men who are going to run this country 10 years from now when the old-timers, who have been working for conservation for a good many years, have passed out of the picture. I never have been so delighted with the work of any group in this country as I have with that Junior Chamber of Commerce crowd. These young men have refused to wait until the old-timers up at the senior chamber of commerce get out of the way so they can have a hand in daily affairs of their communities.

I want you to know about the type of young men who have done this good work in making this conference a success. I have asked Mr. Rosengren of Buffalo, N. Y., vice president of the National Junior Chamber of Commerce, to repeat a part of the address which he read here yesterday morning. Mr. Rosengren. [Applause.]

Mr. ROSWELL P. ROSENGREN. Mr. Chairman, it is impossible to make quite as direct an attack on the microphone because of the physical impediments here as was made yesterday.

Mr. Rosengren repeated his address of the preceding day, with the interpolation: We drove 75 miles up and 75 miles back to form the Hagerstown branch of the Junior Chamber of Commerce last night, and they are going to undertake some of this work. [Applause.]

Chairman DARLING. After hearing from this young man, is anybody a pessimist about the future of this country? I am not, I am ready to turn it over. I have been talking to old heads for a long time, and it is a great inspiration to see these young men showing so much courage and insight into the future program of our country.

We have with us this morning Mr. Lithgow Osborne, commissioner of conservation of New York State. He was delayed in his arrival. He is one of the hardest working commissioners I know of in the country, and we don't want to miss his paper. I have asked him to speak to us before the organization meeting. Commissioner Lithgow Osborne, of New York. [Applause.]

REMARKS OF MR. LITHGOW OSBORNE

Mr. LITHGOW OSBORNE. Mr. Chairman, fellow conservationists, it hasn't happened yet, but I am daily expecting that a new conservation association will be formed, a national association for the protection, promulgation, and preservation of carp. When this occurs, and chapters are duly established throughout the country with a membership anywhere between one and two, all fish and game commissioners will be plentifully "whereased" and informed that the carp is a much misunderstood fish; that a close study of its habits has divulged that it is a devoted father and that its homelife is not only interesting but worthy of emulation; that an examination of the stomachs of 17,043 carp has indicated that it preys exclusively on tadpoles and water bugs; and that the nasty rumor about stirring up spawning beds is nothing but scandal and solely because of its modest habit of burying its nose in the mud when ladies are in bathing; that, on account of all these and sundry other virtues, the most important duty of all conservationists is to protect the carp, for the benefit of unborn generations; that in effect, it is the especial duty of the conservation department to drop all the rest of its labors and concentrate on the preservation of this interesting and valuable species; and that if the commissioner in question refuses aid, he will be denounced roundly in the forthcoming issue of the carp and carpers journal (a biyearly publication, price 3 cents, Canada 6 cents, if any). And when this attack occurs, in due course, the daily prints will run headlines stating: "Game Head Denounced; Noted Authority on Fish Calls Him Fake; Threatens Action."

Thus will another organization with a patent, sure-cure remedy for our conservation troubles be born, making a total of 6,541; and thus do we build for the cause in these United States.

It is unnecessary to add that the carp association will, of course, express the widest possible interest in the conservation of all forms of wildlife. But carp must come first; and if they aren't given their proper place by joint conservation gatherings, then the only thing to do is, obviously, to walk out. [Laughter and applause.]

Is this picture exaggerated? Not entirely, as illustrating the egotistic, self-righteous, noncooperative concentration of large numbers of so-called conservationists upon the one narrow aspect of conservation in which they are primarily interested. While the doctors quarrel over the remedy, the patient is on his way out. And they aren't all regular doctors either—there are M. D.'s, dentists, osteopaths, chiropractors, homeopaths, allopaths, and a few old-fashioned

sawbones and quacks. The most probable solution will be to call for a doctor of divinity to give extreme unction.

In a good deal of the literature concerning the Wildlife Institute and other constructive efforts to bring harmony into the conservation movement, I have seen many scornful references to politicians and implications that they are in the forefront of the enemy forces and need slaughtering. I beg to differ. I am in favor of capturing just as many as possible and putting them into conservation uniforms to lead the army. They may not know much about wildlife, but the best of them know how to lead troops in political battles. And don't forget that conservation, like all other movements which require governmental aid and sanction must, to be successful, fight and win political battles.

Just consider the matter as one of history. Who have been the most effective conservationists in action? If they have not all been politicians there have been plenty of politicians among them. Theodore Roosevelt, for one—a statesman, if you like, but a politician first. Gifford Pinchot, for another. Al Smith, for another—so far as New York is concerned. It isn't generally known, but Al Smith was very sound on conservation and helped a lot. Franklin Roosevelt for another. When he was a young New York State senator he headed the conservation committee and wrote on the statute books the best game breeders' law in the country. Nor was that his only contribution in that era. Later as Governor he put over our enlarged reforestation program and many constructive developments in the division of fish and game. His record here in Washington you all know. Criticize it as you like, the fact remains that no President has stimulated such interest in all kinds of conservation as he. And how about such Senators as McLean, Hawes, Norbeck, and Walcott, and such Congressmen as Weeks, Shires, and Robertson, to mention only a few of them?

I say that we don't need less politics and politicians in conservation; we need more, of the right sort.

Can we get them? Certainly, the very minute two things happen: When we cease being disunited and decide on a program; and when we get behind that program and push, even though we believe completely in only 65 percent of it. And more particularly when we really feel strongly enough about conservation to carry our convictions to the polls, if only occasionally.

It's all very well to weep with Ding Darling over wildlife as "the bow-legged girl whom everyone is sorry for, but no one will take to the party." I've seen plenty of bow-legged girls at parties. Why? Because their fathers owned large banks or factories worth a few million dollars, served champagne with dinner and had something called influence. In place of father, put a million determined uncles, with votes, and 13 million determined sportsmen with votes, and you'll see the politicians hurry to take your niece, Miss Wildlife, to the picnic—bow-legs and all.

Politicians have a healthy respect for organization and leadership and loyalty to that leadership. The ordinary party in the State or Nation gathers in convention and draws up a platform. What its members don't like in that platform they swallow. Only in the most extreme cases do they do anything more than grimace. Then they nominate a candidate who is frequently, if not usually, a compromise.

But the party cohorts follow him even though a lot of them think he is, at best, only fair-to-middling.

That's the kind of organized interest and effort which politicians know and respect. Possibly the harmony is only synthetic. Nevertheless, it works.

And when conservationists can get behind a program which represents majority sentiment even though they thoroughly believe in only 65 percent of it; and when they can follow honest leadership even when it falls far short of their individual ideal, you'll find the politicians quite as ready to jump on the conservation bandwagon as on any other. We will rate some consideration from them then. We don't know. Disunity in the best of causes must always elicit scorn from the practical.

How can it be done? Primarily by being less selfish, less egotistic, less perfectionist, less concentrated on some one particular phase of conservation.

I believe the Wildlife Institute can succeed, if its leaders (and we behind them) stick to the promotion of broad principles; if it does not let the pet ideas of small groups prevail within it; if it encourages, in the concrete, specific laws and regulations which fit into those broad principles.

There has been talk of setting up a program or platform of principles at this conference. I would suggest that it contain just exactly one plank. It would be one on which all wildlife conservationists, whatever their pet theories, would agree.

It would read:

Whereas the wildlife of the United States, and the various States, is our most important single recreational asset, besides being one of our most important economic assets, and

Whereas, the interests of wildlife are being shamefully neglected; now therefore be it

Resolved, That the appropriation for the United States Biological Survey and Bureau of Fisheries and the various State appropriations for wildlife conservation be doubled.

Let those who wish call this a Treasury raid. If it is, you and I know it is a justified and necessary one. In it you have a plank that any and all conservationists can approve and should be willing to work for, even the president of the society for the promulgation of carp. It is a simple plank. It is also, and above everything else, fundamental. Let's get the sinews of war for the fight to save our wildlife and leave until later a detailed discussion of exactly how it is to be done. [Applause.]

Remarks of Mr. Jay N. Darling

Chairman Darling. I am sure that refreshing viewpoint from Mr. Osborne is welcomed.

Mr. Osborne has not been one of the committee that has worked on the plans for a national wildlife organization, but every word he uttered has been in keeping with the thoughts of the small group of men who have been struggling with the problem.

It is very interesting to find that simultaneously throughout this whole country the same conviction has been generated: We must get together, pull together, and stop this frictional and factional warfare among ourselves.

The rest of this morning I hope will not be unpleasant, but it is going to be rather boresome and must, I think, require your very careful attention.

We may best approach the subject of a national wildlife federation by reviewing the processes by which we arrived at the present tentative set-up for a federation. This is not my plan; it doesn't belong to anyone that I know of. We will all be glad to adopt a better one if we can find it. Eight or ten years ago I read a very excellent plan of this kind written by Nash Buckingham, of Memphis, Tenn. Seth Gordon has had a similar program in mind; Calvin Coolidge wanted to accomplish a national movement but when he got hold of the various hot points that were thrust at him he dropped it saying, "That's too difficult, we won't undertake it."

This program which will be outlined to you this morning is merely to get before you something to shoot at. Don't shoot at me!

To illustrate the need for a national federation and its objectives, I will start right back at the beginning of my experience as administrator in the Biological Survey. That office was taken in an emergency, with no desire on my part for the job. It was the most interesting and the most thrilling and exciting experience I ever had. I worked harder than I ever had in my life. I made many mistakes, for which I am very sorry, and I made many enemies, and of some of the enemies I am very proud. [Applause.] But on the whole I found few who harbored real enemity when we came to an understanding of the common objective—more wildlife! And if you will believe me honestly, it is more lack of common understanding of each other's motives than it is selfishness on anyone's part. We need an avenue for the exchange of ideas. Even between such extremes as William T. Hornaday on the one hand and Col. Arthur Foran, on the other—if they ever got right down to cases with their backs up against the wall and told each other all the facts, I would not despair of a successful working accord.

I suspect you folks have had nervous fits and jitters over the thought of what might happen on the floor of this convention. Have them if you want to. You can't do any good by hiding your feelings. I want to confess, however, that I am no Robert's Rules of Order expert; I am a cartoonist up here trying to do my job for wildlife and I will do it the best I can, come hell or high water. I do want you to keep your eye single to the main objective. We here are all volunteers in a common cause. I don't know of anybody here who has been appointed by the President of the United States, by God, or anybody else, to dictate the policy of this convention. You are here as conservation representatives of wildlife, and not of any faction, East, West, North, South, State, political, Republican or Democrat.

Is that satisfactory? [Applause.]

All right, let's conduct it on that basis.

The first thing that I ran into when I came into governmental service was the next year's budget for the Bureau of Biological Survey. I had heard about budgets and drawn pictures about budget directors and really felt that I was quite familiar with what a budget ought to be. I knew that as a cartoonist the taxpayer was generally represented as being a victim of the swelling budgets of the United States Government. Therefore, when I went before the

Budget Bureau I felt that my duty to the taxpayer was first, my duty to the Bureau was second. Really I wanted to do an honest job of getting money that could be honestly and intelligently spent in the interest of the taxpayer. I received definite instructions: "You must cut down your budget, we must economize." I took them at their word and I cut, saving those elements which needed most to be saved although every cut was a sacrifice of efficient wildlife management, but I cut it, and they cut it some more. I was the only bureau in the Department of Agriculture in the United States Government that had a cut. That was one of the mistakes for which I was very, very sorry.

It so happened that among the great problems of the Biological Survey was one of making available the vast amounts of technical information assembled there. We had conceived the idea that a land-grant college (that is an agricultural college where the Federal Government cooperates with the State government to extend the wise use of land among agriculturists) might be a useful avenue down which we could send relays of information. If as a bureau we could furnish the various State land-grant colleges with wildlife technicians who could make demonstrations on the ground, perhaps it would catch fire with the neighbors, that the county agents affiliated with the colleges would see the results and go and tell the farmers:

This is a good experiment. Look at it! It may be profitable to you to adopt some of these wildlife practices on your farm.

In our budget we asked for $42,000 to set up seven experimental projects in seven State land-grant colleges, but it was cut out by the guardians of the Treasury. When we came up to the final hearing in the Appropriations Committee of the House of Representatives there was no $42,000.

A peculiar thing happened in the hearing before that committee. You may not be aware of the governmental rule that a bureau chief may not ask Congress for money or anything else. No bureau representative is privileged to ask Congress for money no matter how badly needed. That is one of the eccentricities of governmental procedure.

The $42,000 was gone—blue penciled—and with it the service we had hoped to inaugurate.

But during the hearing a Congressman, of great erudition, who has my undying admiration and respect, entered the committee room, leaned over the shoulder of the chairman and said:

Where is that land-grant college project? Did you scratch it out?
Yes, it is out.
I'd like to see that in there.
Oh, all right.

[Laughter.]

The $42,000 then was reinstated. We now have nine land-grant college projects in full force and performing, I believe, a great service to the States. But their success hung by the narrow thread of an accidental interview down in Alabama. I happened to mention in an interview this project as one of the things that seemed to promise real progress in wildlife restoration. It got into the papers. The State conservation commissioner saw it. He wrote

to his Congressman and the Congressman did the rest. That was an accident, but it suggests the possibility of a system.

One letter to a Congressman from the folks back home will accomplish more than all the prayers and begging of a bureau chief.

Do you know why so many C. C. C. camps are eradicating the cover on the side of drainage ditches, cutting down vegetation instead of planting game cover, why they are building roads and draining marshes instead of conserving wilderness areas and impounding water? Do you know why wildlife has not had the quota of emergency projects? Because Congressmen are importuned by their constituents, and Congressmen, as Commissioner Osborne said this morning, do the bidding of those people who elect them. And conservationists never have rated any political strength.

That is not any indictment of Congressmen; it is not any indictment of any official of the Government; it is indictment of you folks who are interested in wildlife. When there were millions of men and billions of money available for emergency work wildlife had no program to offer or projects planned ahead.

Let us again recall the way we got the $42,000 for the land-grant colleges and the way we missed getting nearly everything else. And that we failed to receive recognition and our quota of emergency funds was from no lack of effort on the part of the Biological Survey. I want to repeat that Congressmen are looking out in their own backyard and seek to carry out the requests of their constituents. Whether they are Republican, Democrat, or Socialist they would rather serve you if you can bring more votes to their support.

This body here gathered together should devote itself to an organization which will first, unite on a comprehensive program of common aims and second, use the agencies which our Government provides to see that the program is carried forword. Specify your objectives and use the pressure of your great numbers where it will do the most good—on your elected officials. As individuals you will never devote sufficient attention to acquaint yourselves with all the intricacies of governmental procedure nor as individuals will you ever be able to keep posted on the thousand and one ramifications of the wildlife problem in all the bureaus, States, and Territories under our Federal jurisdiction.

Leave the technical questions to the technical agencies of Government. For instance as individuals you wouldn't be effective in eliminating the oil pollution from New York Harbor—a menace which causes the loss of thousands of wild ducks each year. But you do know how to approach the man who knows where to touch the button which will control the oil that is dumped in New York Harbor. And lest you may not know the address, it is your Congressman, not the Biological Survey. The Biological Survey suffers in impotent misery because it has neither funds nor jurisdiction. Its protests and appeals go unnoticed. It is just another Government bureau. But you, as individuals, are the most powerful agency in the country, and your elected Representatives and Senators in Washington are here to do your bidding. That is the machinery which this Government has set up for you to use. Use it.

For fear you may think this is just another organized minority trying to enforce an unwelcome principle down the throats of an

unwilling public, I should like to say that it is just the other way. In my judgment, the public generally is keenly interested in protecting the wildlife resources of this country but has remained inarticulate because they have not known how to approach the problem.

As former chief of the Biological Survey, I was keenly desirous of performing a completely competent service in the interest of wildlife. If there was any public demand for that service I never learned of it while in office. Congress didn't know there was such a public demand. The Secretary of the Treasury didn't know it. The Budget Director didn't know it, and the President didn't know it. That makes it almost unanimous.

Come to think of it, as State fish and game commissioner there was the same ghastly silence on the part of wildlife proponents. I venture to say there have never been any Governors, State legislators, or Members of Congress who were even conscious that 12 to 14 millions of the voters of this country were vitally interested. I never knew a President, a Senator, or a Member of the House of Representatives who wanted to despoil his country and who would not rather do the thing right rather than the wrong if he had the majority support to uphold him. Therefore, if the exploiters outnumber the 14,000,000 conservationists, then it is your fault entirely.

I want to make it quite clear that if wildlife conservation is to succeed, the demands must come from the individual voter to your elected Government officials, by word of mouth, by letter, or by wire. And to illustrate the change which must take place in your methods, I am going to quote from messages that have come in during this convention. They are characteristic of the mail and telegrams that came in during my 2 years of service in Washington.

Wire no. 1 is from an Izaak Walton League Chapter asking that three dozen pheasant eggs be allotted their chapter from this conference, that they needed pheasants and couldn't get them from their State commissions.

Wire no. 2 wants this conference to buy 80 acres of exhausted farmland for wildlife refuge.

Wire no. 3 was handed to me by a friend, and judging from the contents of the telegram it is from a very able and smart gentleman. He speaks for his State and says that "if that man Darling has anything to do with the new organization you can count us out."

All right, I accept. I look upon the work in the field of wildlife as a sort of self-imposed martyrdom, and would be delighted to step aside for anyone who will carry on the work. All of which is somewhat aside from the point I wish to emphasize—that if you want pheasant eggs, if you want better law enforcement, if you want some of the wilderness areas preserved for nature's storehouse, if you care to have your rivers and lakes protected from pollution—even if you want another kind of conservative commissioner for your State, don't try to get them by writing a letter to the editor of your newspaper, telling your troubles to your barber or the soda fountain clerk or the Chief of the Biological Survey. Conservation commissioners and biological bureaus are willing servants but they can only administer what Congress and the State legislators allow them. Get together on a program of reasonable demands so that your requests will have

B30929

A, Young avocet wading at the edge of marsh, Bear River Migratory Bird Refuge, Utah. (Biological Survey photo.)

B16178

B, Nest and eggs of avocet. (Biological Survey photo)

B1124M

A, Flock of pintail ducks in flight. (Biological Survey photo.)

B41019

B, Nest and eggs of pintail. (Biological Survey photo.)

some unity of purpose and write to your elected officials—mostly legislators. Money and legislative backing are the two great necessities for a more competent wildlife program. Both are subject to legislative control. Legislators are responsive to individual pressure from those who vote. You belong in that pressure group.

To accomplish a systematic job of bringing the main issues to the attention of your elected officials you must first coordinate the groups of citizens who are interested in the cause of wildlife conservation. There must be a unified program as well as unified pressure. We must have a network of connections between the various organizations through which we may communicate and act with some accord. It is manifestly impossible for any public or private agency to write to 14,000,000 people every time a topic of wildlife conservation needs attention. Even the writing and addressing of 1,000 letters, with the frequency required, is impossible. And yet it is essential that the individuals be kept abreast of the movement or the one object of the federation, namely, that the individuals may directly make their demands on their elected Government officials, will fail.

Those of us who have sought to work out a mechanism to accomplish this objective have conceived a system somewhat parallel to that employed by organized labor. Local trades and labor assemblies are made up of the local unions. The local trades and labor assembly sends its representatives to the State Federation of Labor and the State Federation of Labor elects its individuals to the National Federation of Labor. Using labor's method as a guide let us suppose that all the county organizations interested in wildlife conservation get together in a county wildlife federation similar to the local trades and labor assembly. This county federation will elect a representative to the State federation council which, in turn, will choose a representative from the State to serve on the national federation council. The national federation council will elect an executive committee and maintain a central office out of which will be distributed the general information service to the country at large. That distribution will be accomplished by sending from the national federation offices to the State federations such material as may be pertinent to a comprehensive program of wildlife conservation. The State federation council will, through its county representatives, transmit the data to the county federation and the chairmen of the various local organizations will communicate the information to their respective groups of individuals who may use their own judgment on any issue presented to them whether or not they shall make an issue of it with their elected representatives.

You will note that the system involves no delegation of power to the federation officials, thereby avoiding the historic controversy of "Who is going to control the vote". The policies will be made only by the individuals who are alone responsible for the opinion expressed to their political representative. In my judgment any federation which results from this conference should avoid as it would a plague the possibility of ever reversing the above order of procedure. Any effort to express a mass sentiment through the federation officials or to use the federation officials as spokesmen to accom-

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plish the purposes of wildlife conservation will fail for the same reasons that such methods have failed in the past. The only practical method is to keep the individuals informed and let the individual speak through his Congressman, or if the issue is within the State jurisdiction, then speak through his State representative.

You will realize that we who are gathered here in this conference have no official standing as representatives of our State or local communities. There are no accredited delegates to this conference. All are here as volunteers. Any decisions or any program which we may adopt will therefore be only a tentative outline which must be confirmed later when a federation made up of duly elected representatives has been made possible by permanent federations within counties and States.

Beginning at the root of our necessities this chart attempts to show how a county federation of all the local conservation organizations may be brought in together. Within most of our well populated areas there will be already in existence in each county several organizations interested in wildlife conservation. There will probably be a rod and gun club composed of sportsmen, perhaps an Izaak Walton League chapter, a local Audobon Society and a garden club, 4–H clubs, farm bureaus, and any civic organization interested in wildlife conservation should not be excluded. In fact, the greater the breadth of contact in your county federation, the stronger will be the force generated for wildlife.

Having federated the organizations within the county a representative should be selected from the county federation who will serve as a member of the State federation. In larger States with a great many counties it may be desirable to group the counties into districts corresponding to congressional districts, or otherwise. The necessity for this subdivision is optional with the State and experience will dictate the expedient method.

The chart shows the State federation council made up of representatives from the county federations. This State council will constitute the State federation and elect the State representative to the national federation. It may here be found desirable as in the larger States to group the States as counties were grouped by districts, from which a representative will become a member of the national council. This intermediate step may be found necessary in order to make the national council less cumbersome. Such questions of detail will be matters for the federation to decide, when it comes into existence.

Temporarily each State has been requested to caucus and select five representatives who will act as spokesmen for your State during the process or organization here in this conference. It is a simplified method of handling the minute details of the organization program which could not be conveniently handled on the floor of the convention.

These committees of five from each State will be expected to act as representatives, both here and upon your return home, as temporary officers of the Federation, and will be expected to serve as organizers, within the various States, of the State federation.

These committees will only relinquish their responsibility when their State has been federated, and when out of that State federa-

tion have been chosen such permanent official representatives as may be the pleasure of the State federation.

A tentative draft of a constitution for a national wildlife federation has been drawn up. After such discussion and amendments as may be made in this conference, a copy of it will be mailed to the State committeemen for adoption or amendment by the States. Not until a majority of the States have ratified the constitution will the national federation become an official organization and begin to function.

Are there any questions?

Question by Col. Arthur Foran

Col. Arthur Foran. As I understand it, your proposed set-up is temporary for 1 year. I want to say that I am speaking for the State of New Jersey's delegates here and nothing that we might say will be either personal, frictional, or factional. We want to help, we want to go along a hundred percent, we want to do everything we can to help your organization. We are ready to take your advice, we are ready to offer some, but I should like to know clearly: Do you suggest that your program and your set-up is just for the 1 year?

Chairman Darling. My dear Colonel, I suggest nothing. This is no dictated meeting. You can determine it yourself. I hope we will put the question to get a general opinion whether they want to federate after this, and what you do in New Jersey and what you do in the country is all up to you, sir.

Colonel Foran. We are just here to help the whole show, that is all.

Chairman Darling. Nobody can determine in advance whether it will last a year or a thousand years, as far as I know.

Are there any other questions? If not, I should like to call on a couple of experienced men here. Mr. Marks Bump has set up, for instance, in New York State a method of operation which has worked successfully in carrying out the State conservation program. Will Mr. Marks Bump come up here? I want him to tell you in a very few words the simple method by which he has carried out a federation program in New York State. It isn't the only method. I think you have one started in New Jersey, have you not, Colonel Foran? I think they have one started in Pennsylvania. I know they have a good one in Indiana and I believe they have one started in Ohio; I saw State federations initiated one in Oklahoma and Colorado. We will appreciate a brief history of New York's experience.

Remarks of Mr. Marks Bump

Mr. Marks Bump. Ladies and gentlemen, before I speak about the New York State Conservation Council, let me say a word on how we arrived at a plan similar to the one on the further chart. In New York State, like a great many States, we have had a great many State conservation organizations, all of which have accomplished a great deal for conservation during the past 25 or may I

say 40 years, but any of these organizations had a make-up of delegates that might come all from 10 counties or all from 6 counties or 15 counties, and when we approached the legislature in New York State, the expression was not from every county in the State but it might come from the western part of the State or the northern part of the State or the central part, and often it occurred in the State of New York that from the east and from the west and the north and the south four different opinions were sent to the New York State Legislature regarding a conservation measure. Therefore, the idea to express every county's opinion resulted in a plan such as you see on the further chart.

Each federation of the county is made up a great deal as you see it there. Our largest federation is in 1 county composed of 28 different groups. In that group are Rotary Clubs, Kiwanis Clubs, Granges, bird clubs, and sportsmen organizations. They affiliate into a group called the county alliance or county federation—they have their own names. Those groups elect a county chairman directly to the State office in Albany.

Now, we had it brought up on several occasions to give a voice or a voting power directly in that State to another organization which might have 500 individual members, with a president of the State organization.

In trying to do that and giving the voting power to a president in a State organization, we destroyed the value of the county chairmen, and we asked those people to assimilate individual membership in their local chapters throughout the county groups, which has proved satisfactory.

Today in the State of New York the State council is 2 years and 6 months old, it has affiliated out of the 60 counties, of which 5 are in the great metropolitan area of New York, about 44 federations, which have elected councilmen. These 44 federations comprise about 250,000 people. Now, they are not all sportsmen because we have 500,000 or more licensed sportsmen in New York State, but I would say, roughly, that about 60 percent or 70 percent, maybe, are licensed sportsmen, but the word "sportsman" covers a lot of people. There are a lot of Rotarians that are licensed hunters and fishers, there are a lot of people who fish in New York State who don't wear a man's costume, and there are a lot of other people in these federations that you might call sportsmen. A sportsman covers men who are Rotarians, bird lovers, farmers, and other types.

I believe that where States haven't got an organization of this kind you will find it very easy going out through your counties to get together a group of the present people; you may not get them all, but you will find out if you can get one county organization to affiliate in a State group and express the ideas of the State organization or policies that they want enacted into conservation, it won't be very long before the other organizations of different thought and different policies will join in the county federation to support State-wide conservation measures and national conservation measures.

Thank you. [Applause.]

Chairman DARLING. Is Mr. Ralph King in the audience? Mr. Ralph King I want to tell you is one of the younger men, a member of the Junior Chamber of Commerce, and directly interested in some sort of a mechanism.

In order that Senator Fred Walcott, one of our best conservation servants in the United States, may have a little warning, as soon as Ralph King gets through I am going to call upon Senator Fred Walcott to take the platform and give us a message which I know you will welcome from one of our best and most beloved conservationists who has been of great national service.

Mr. Ralph King of Minnesota.

Remarks of Mr. Ralph King

Mr. Ralph King. Ladies and gentlemen, we have had no such federation in Minnesota. The vice president of the junior chamber of commerce who spoke earlier this morning told you of a meeting in St. Louis held the first part of January in which the members of the junior chamber of commerce decided to undertake the task of bringing about as many of these State federations before the date of this conference in Washington as they could possibly bring about.

I have not had an opportunity since coming here to find out how many of these State federations have been actually affected. I know that in Minnesota when we came back from the St. Louis conference about the fifth of January, we immediately got in touch with every organization in the State of which we could find any record. That included not only sportsmen's organizations, but the Farm Bureau, the Grange, the Audubon Society, Boy Scouts, even the hotel keepers' associations, the American Automobile Association, every organization in Minnesota that we felt had any interest either direct or indirect in this matter of conservation and in any of its angles, whether they be economic, social, recreational, esthetic, biological, or scientific. We even asked at the University of Minnesota that the Minnesota Academy of Sciences, that the State chapter of the American Forestry Society, be represented at this meeting.

The meeting happened to be called upon the coldest day of the winter, and yet ninety-some people were present in Minneapolis; a tentative program was set up; a committee of 27 including representatives from every organization within the State, both Statewide and local, unaffiliated groups, is to meet a week from Sunday. This committee of 27, representing every one of these organizations that has an interest in conservation to appear at this meeting, will decide upon the method of State organization at that time. I believe that in the light of what Mr. Darling has said that will be satisfactory to the gentlemen who have already done so much work along these lines. I cannot say now whether it will follow the outline on that chart or not.

That tentative federation elected 18 delegates to appear at this conference. Not all of them could be here. About 9 or 10 of them are present in Washington this week. Yesterday that delegation and the other members from Minnesota held a meeting and a delegation of five was elected to represent the State of Minnesota this morning. Now that delegation of five represents not only this federation which is in process of formation, but it represents also the State departments concerned with conservation matters in that State. We have felt that the thing we wanted to avoid most was setting up anything that could be interpreted as attempting to take away the carrying out of conservation practices from the duly constituted

authorities or agencies that have that task in hand. We are not trying to do away with the State conservation commission and we certainly are not going to take any part in attempting to tear down and make over again the United States Government here in Washington. But every member of this Minnesota delegation is 100 percent for more and better wildlife conservation. I believe that I can speak for that delegation and say that they are for a federation not only locally but for each State and for the United States, and I am sure will be glad to cooperate in any way even to the extent of making certain concessions which may in the end allow us to have our own way only 65 percent of the time. [Applause.]

Chairman DARLING. While Senator Fred Walcott is on the way to the platform, I want to say that the original conception of this federation was a citizens' group. Citizens aren't very well organized. Sometimes the commissioners who have come down here are just as welcome as the flowers in May, so far as I am concerned, and I have nothing against commissioners—I have been with them and have been one and I sympathize with their troubles, but I do want you to think of this eventually as a citizens' group helping commissioners and backing them up rather than composed of elected officers. Think that over.

Senator Walcott has just come to the platform and I introduce him with affectionate greeting. [Applause.]

REMARKS OF HON. FREDERIC C. WALCOTT

Hon. FRED WALCOTT. Mr. Darling, my friends, fellow conservationists, I am at a loss to know what to say; it has been so well said. I have never heard a better address on the subject of conservation in its broadest aspect than we have heard this morning from the Junior Chamber of Commerce—I thrilled all over as that young man spoke; we have needed that message for several years. A good many of us have attempted to say something like that, but I have felt that all the time we have lacked punch, not conviction, but have lacked punch which comes from a lack of complete cooperation when great assemblages like this are gathered together. Today we have it. This is our day I am sure. We must make it our day, and let me remind you of what has happened, in just a dozen words, in the past in order to place the proper emphasis on this day.

A few years ago (it seems like yesterday) President Coolidge tried it. Mr. Darling has graphically depicted his withdrawal from the stage. It was a fizzle. I was on the executive committee and we had a good many meetings, but it was so diffuse, it took in horseshoe pitchers, and wood choppers, and every conceivable thing—I don't know but that we had in there crap games; we had everything; we covered the whole field of out-of-door activities. And the result was that it got nowhere, and it never will when you try to set up an organization that covers all functions of life.

Then came along an attempt, or at least a consideration of an attempt, to reorganize some of the functions of government, seriously considered by various groups in Mr. Hoover's time, the consolidation of all the conservation activities in one department. That was so full of dynamite that it was dropped like a hot coal.

Then came along a very significant movement as the result of a conference called almost exactly 2 years ago this week. I think it was the last of January 2 years ago. It followed the American Game Conference in New York. It represented practically every single legitimate conservation organization in the country, organizations devoted to sport, to the protection of wildlife, to the protection of field and stream, that is the environment of wildlife, the habitat, and nearly all, I think all, of the publications engaged in propagandizing this thing, engaged in publicizing the efforts at conservation and the sportsmen's point of view, including the Izaak Walton League, American Game; the Audobon Societies—they were all represented. They signed a compact there which I felt was a peace compact, and I still believe it is; I believe that every one that signed that program of cooperation (and it was complete and it was pretty final and it was definite) is of the same mood today.

We met, every one of those organizations represented by one or more persons, at the executive office of President Roosevelt. We were there for an hour and he talked with us. It looked to me as though our day had come then, but it hadn't.

We have had bad seasons, we have had our troubles with the wildlife; our waterfowl have gone down rapidly since then even, and we have found it utterly impossible to take accurate census of what we have left of our resources. They vary as far apart as the poles. Some of them are probably somewhere near the correct figures, but we don't know. We have got to keep at it. It is a very difficult thing to do. No two people perhaps will agree as to how a census should be taken. It takes a vast army of people interested, counting simultaneously, to take such a census. To show you how encouraged I was I will cite just one incident of that day.

A woman with whom I had differed quite violently at one of the National Audubon Society meetings, with whom I had differed in many respects, I thought was taking an extreme position in her publications. Although a great friend of Dr. Hornaday's and having been on his executive committee for years and still a trustee of the New York Zoological Society, I differed with him a great deal, but secretly I had given those two people a great deal of credit for keeping the sportsmen's feet on the ground and scratching dirt and trying to make good—I mean the honest sportsmen—and I remember very caustic criticisms of this lady at the hearings where I presided, hearings of the Agricultural Committee, afterward the Committee on Wildlife. At the end of that day she volunteered this information that more had been accomplished in her opinion as the result of that conference than in many years of various attempts and that the dawn of a new day had arrived. I said to myself, "If Mrs. Edge will admit that we have done something I know that Mrs. Edge never said anything that she didn't mean."

So let's jump ahead from that time to this, and I am through. Just one word: That we keep that peace document as the foundation. It was specific enough to form the foundation, the broad foundation, for what we are trying to do today.

Let's hold on to what we have and let us take one more step; in such a way that we will have a real federation that is active. And I have just one misgiving today in all that has been said. We must

leave here with the enthusiasm, with the impetus gained from what has been said. Lithgow Osborne gave us a perfect picture of what has been going on; the travesty of it all, the tragic humor of it all was perfectly depicted by him. I never heard a better presentation, it couldn't be made; and then supplement that with Ding's cartoons and you have got the whole situation. It is a travesty, it is a horrible tragedy. I am dealing as Commissioner of Welfare in Connecticut today with the lower side, the unfortunate side of human life, and from conservation of so-called wildlife I am trying to rescue human health and happiness which have been seriously endangered by these long years of horrible depression, and those of you who haven't dealt first-hand with this problem haven't any conception of it. We are feeding in Connecticut alone, a thrifty State, one of the thriftiest of the States, a State which is practically out of debt, 340,000 people every day who just can't feed themselves. Now we are dealing with something that is equally tragic in the destruction of native wildlife, and let's not forget that native wildlife cannot be reproduced, cannot be saved, cannot be brought back, cannot be increased unless we have first dealt with the home life of that wildlife, that is the environment, and that must be done regionally. That alone is a great step. Those regions indicate to us a forward step because geographically we are so diffuse, we differ so radically in the treatment of the various types of wildlife, that we cannot agree on a single platform, there are infinite details, and we must endeavor to reach it all.

The number I don't care but I know you will deal with this wisely. I should like to see a broad platform that will start an organization adopted today, that will insist upon regional treatment, and that will not wait for a whole year before we tackle it again as a permanent organization. That to my mind would be fatal. I have seen these horrible delays going on year after year. We lose our enthusiasm, we lose the stimulus that comes from men in earnest, from men who speak well, men who have a message, and who know the history of this. Let's resolve that we will come back here, those who are duly authorized from the States, say one delegate from each State or however you may want to do it, but let's not wait for a year, let's do it in 1 or 2 or 3 months, let's do it at the earliest moment and get this thing clinched. I am satisfied that the day that the wildlife has been praying for for generations is here; let's make the most of it. [Applause.]

Chairman Darling. Senator Fred Walcott is not the only one of the honored guests present. I wish we could take time to call on all of them. It would be delightful to hear from them. I just had a note come up here saying that the Federation is complete in Pennsylvania and operating, which reminds me that Gifford Pinchot is in the audience. Thirty-odd years ago they started forestry. They saw at that time that you couldn't keep taking out and never putting anything in without exhausting the supply. I should like to have him talk to us but I just can't do it. We have got to get just so much work done today. I will greet Gifford Pinchot. Will you stand up and take a bow? [Applause.]

There are several Governors in the audience from the States. I should like to call on each one of them, but I have got to get down

to business. We are three-quarters of an hour late because you didn't get here on time this morning.

I will entertain a motion whether or not this body chooses as its main objective to form a federation. Let's commit ourselves to that subject.

Motion by Mr. Paul O. Peters

Mr. Paul O. Peters (St. Louis, Mo.). I move that it be taken as the sense of this meeting that an organization be formed as outlined by Mr. Darling.

(The motion was seconded by several members.)

Chairman Darling. Unless there are objections to the motion we will speak to the question. All those in favor of the motion which is merely a statement that the objective shall be a national federation and we shall proceed to organize say "aye". Negative. The vote is unanimous. [Applause.]

In order that we may proceed according to the free rules of American citizens I want nominations for the chairman to continue your business. I will usurp no office. I want you to nominate a chairman to carry on the organization.

Nomination by Mr. Colin M. Reed

Mr. Colin M. Reed (director, Pennsylvania Federation of Sportsmen's Clubs, Washington, Pa.). I nominate Mr. Darling for chairman of this federation.

(The motion was seconded by Judge George W. Wood, of the Izaak Walton League, Iowa.)

(Mr. Seth Gordon took the chair.)

Motion by Mr. Thomas A. E. Lally

Mr. Thomas A. E. Lally (Spokane, Wash.). I move the nominations be closed.

(The motion was seconded.)

Chairman Gordon. Are you ready for the question? All in favor give your consent by saying "aye"; opposed. It is so ordered. Now we will vote on the original motion. You voted on the motion that nominations be closed. All in favor of Mr. Darling serving as chairman of this conference while you are organizing a federation say "aye"; opposed. It is so ordered. [Applause.]

(Mr. Darling took the chair.)

Remarks of Mr. Jay N. Darling, Chairman

Chairman Darling. Thank you; I appreciate it, but I don't welcome the job. The main objective has been stated. The Chair will rule that other discussions until that question is out of the way are out of order, that no discussions of anything except those that pertain to the direct federation will be discussed until we have formed such an organization. [Applause.]

In order that those here who do not know the preliminaries may know them, this body was too unwieldy, we asked each State to hold a State caucus to name five members representative of all the

aspects of the State interested in wildlife, if possible. I am not sure that they all have completed their duties, but it has been 48 hours since the order went forth and if you can't operate in that time you can't operate at all. I therefore am going to presume that the States have named the five men as representative of their States. I am going to call them into official meeting here now and they in turn will prepare the afternoon order of business for organization. At 2:30 this meeting will reconvene as a body to discuss the order of business and program devised by the representatives of the various State groups.

Will all the five men and five women committees representing the States move to the forward end of the hall at this time and the rest of them are dismissed unless Mr. Gordon has some announcements. If you haven't selected your committees the States will have to provide some representation.

(The general meeting adjourned at 11:50 o'clock.)

WEDNESDAY AFTERNOON SESSION, FEBRUARY 5, 1936

(The meeting convened at 2:50 o'clock, Mr. Jay N. Darling presiding.)

Chairman DARLING. Will the meeting please come to order?

You will recall that each State was asked to caucus and select five representatives from their group. Those five representatives gathered in regions of States and selected their regional delegates, each acting merely as an acting interim officer to serve as the mechanism to carry the story back to the States. We will not, by this process, be able to form as a federation, but we can recommend methods of becoming a federation, and only as those States formulate themselves into federations and adopt a federation may we come back and form a national federation. So you are acting delegates, but not a federation until it has been so confirmed by the States, just as we adopted the United States Constitution. You could write one, but it wasn't a Constitution of the United States until it was referred back to the States.

So, what we are trying now, and what we are presenting, is the simplest mechanism that we could provide to send back to your States for consideration. There is no compulsory move to make them adopt it as it is presented. They will have a chance to discuss it, change it, bring it back, alter it in any way, and, when a majority of the States have elected a chairman with a State federation supporting him, officially, then we will call the group together and complete the federation which you this morning announced was your desire.

If the secretary has the list of the 13 representatives of the regions, I would like to have him read them.

Secretary SHOEMAKER (reading):

Region no. 1, F. C. Walcott, Norfolk, Conn.
Region no. 2, N. Marks Bump, Binghamton, N. Y.
Region no. 3, A. C. Heyward, Columbia, S. C.
Region no. 4, I. T. Quinn, Montgomery, Ala.
Region no. 5, Kenneth Taylor, Louisville, Ky.
Region no. 6, L. A. Colby, Chicago, Ill.
Region no. 7, W. J. P. Aberg, Madison, Wis.
Region no. 8, William J. Tucker, Austin, Tex.
Region no. 9, Frank J. Brady, Atkinson, Nebr.
Region no. 10, Elliott Barker, Santa Fe, N. Mex.

Region no. 11, William L. Finley, Portland, Oreg.
Region no. 12, Joseph S. Dixon, Berkeley, Calif.
Region no. 13, G. W. Grebe, Kuna, Idaho.

Chairman DARLING. Is the committee ready to report? Mr. I. T. Quinn, I believe, was chosen chairman of the committee. The chairman is now ready to report.

REPORT OF CHAIRMAN J. T. QUINN

Mr. I. T. QUINN (Montgomery, Ala.). Mr. Darling, members of the conference, as chairman of the committee of 13 which was chosen by the State delegates a few minutes ago, I am ready to make a report of the short business session of your committee.

At this meeting we read and recommend to you as a basis for consideration a constitution which will be eventually considered and adopted in some modified form, if not as it is at present drafted, back in your States; and, as Mr. Darling suggested, when a majority of the States have so acted, then, subsequent to that, another conference will be called, or a meeting will be called of the official delegates from the States, to set up what you recommended by unanimous vote this morning, a permanent general wildlife federation.

May I ask the secretary of that committee, Mr. Carl Shoemaker, to read for your information the basis for a constitution which we recommend to you for your favorable consideration, to be used as a basis back in the States as you set up your federations, for adoption or modification as you choose? Mr. Shoemaker.

READING OF PROPOSED CONSTITUTION BY SECRETARY SHOEMAKER

Secretary SHOEMAKER. If all of you do not have copies of the constitution, which were passed out this morning, the tentative constitution, there are a number of copies here at the rostrum which you can get. It might be well for you to have them in order to follow some of the recommended changes.

There is no change whatsoever in the preamble:

> Believing that the natural resources of this continent are economic, social, recreational, and esthetic assets which should be restored and perpetuated for our posterity, and realizing that this can be achieved only through an aroused and enlightened opinion among the people of this Nation, we dedicate this federation to these ends.

Then—

ARTICLE I. NAME

> The name of the organization shall be "General Wildlife Federation"—

and then the amendment is,

> and shall be incorporated as a nonprofit membership corporation under the laws of the District of Columbia.

That is not an added amendment. It is simply pulling out from another portion of the constitution that phrase and putting it in its logical place.

There is no change whatsoever in article II, "Objectives", except that on the recommendation of and in consultation with the representative from the Dominion of Canada a paragraph called (*d*) has been inserted, so that the complete article II now reads:

ARTICLE II. OBJECTIVES

The purposes of the federation are:

(*a*) To organize all agencies, societies, clubs, and individuals which are or should be interested in the restoration and conservation of wildlife into a permanent, unified agency for the purpose of securing adequate public recognition of the needs and the values of wildlife resources.

(*b*) To develop a comprehensive program for the advancement, restoration and conservation of wildlife.

(*c*) To present to the public such pertinent facts, discoveries and information as may contribute to the solution of the problems involved in the restoration and conservation of wildlife.

(*d*) To cooperate with other general wildlife federations in other countries on this continent.

Now, after much consultation with many groups yesterday and the day before and on Sunday, it was recommended that article III be amended to read as follows:

ARTICLE III. THE FEDERATION MEMBERSHIP

The federation shall be made up of one representative from each of the several states, the territories, and the District of Columbia, selected as hereinafter provided. Nation-wide organizations and societies having their principal offices in the same region and with the approval of the board of directors of this federation shall be entitled to one representative for that region. Such representatives shall be elected by the joint vote of the boards of directors or trustees of such organizations or societies.

Then,

Wherever the word "State" or "States" is used in this constitution it shall be deemed to include "Territory", "Territories", and "the District of Columbia."

The representative from a State must be selected by a general federation of interests whose primary purpose is the conservation of wildlife. Said representatives shall be elected in the manner provided by the constitution and the bylaws of the federation of that State.

Pending the formation of such a federation within any of the States, and until such organization is perfected and has made its own selection, an ad interim representative may be appointed from that State by the board of directors of this federation.

In order to clarify the language and clear up the method of selecting "the board of directors", a few words have been added:

ARTICLE IV. BOARD OF DIRECTORS

The board of directors shall consist of 19 members, 13 of whom shall be elected by the State representatives of the several regions.

The Nation shall be divided into the following regions:

No. 1. Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.

No. 2. New York, New Jersey, District of Columbia, Pennsylvania, Delaware, and Maryland.

No. 3. West Virginia, Virginia, North Carolina, and South Carolina.

No. 4. Georgia, Florida, Mississippi, and Alabama.

No. 5. Tennessee, Kentucky, Arkansas, and Missouri.

No. 6. Ohio, Indiana, and Illinois.

No. 7. Michigan, Wisconsin, and Minnesota.

No. 8. Oklahoma, Louisiana, and Texas.

No. 9. North Dakota, South Dakota, Nebraska, Kansas, and Iowa.

No. 10. Colorado, Utah, Arizona, and New Mexico.

No. 11. Washington, Oregon, and the Territory of Alaska.

No. 12. California and Nevada.

No. 13. Idaho, Wyoming, and Montana.

At the top of page 3 there is a change, making it read as follows:

The membership of the board so elected (instead of selected) may be representatives of the States or they may be chosen from the citizenship of some State, but in all cases every member of the board must be a resident of the region which he is elected to represent, and upon his removal from such region shall cease to be a member of the board of directors.

In addition to the 13 members of the board of directors selected in the above manner, there shall be 6 members at large, not less than 3 of whom shall reside west of the Mississippi River.

The six members at large shall be elected at the annual conference of the federation.

The members of the board shall serve for a period of 3 years from the time of their election and qualification, except at the beginning six of them shall hold office for 1 year, six for 2 years, and seven for 3 years, and thereafter as their terms of office expire they shall be elected for a 3-year term. The terms of office in the beginning shall be determined by lot.

The members of the board of directors representing regions shall keep the States within their regions informed as to the work, plans, and progress of the federation.

The principal office of the federation shall be in Washington, D. C. The board of directors shall hold its annual meeting on the third day of the annual conference, called under the auspices of the federation, at such time and such place in the city of Washington or elsewhere as may be fixed, at least 30 days in advance of said meeting.

The board may, during the year, hold such other meetings at such times and places as it may decide upon, provided, however, that the chairman of the board shall call a special meeting upon written request of not less than seven members of the board and upon 15 days' notice.

The duties of the board of directors shall be to direct the business of the federation; to receive annual reports from its officers; to promulgate these reports and to present to the annual conference a report of its activities during the preceding year; and to perform such other duties and engage in such activities as are necessary and proper to carry out the purposes and objectives of the federation.

On page 4 the fourth paragraph has been stricken out, so that the page now reads:

In the furtherance of the objectives of this federation, the board of directors may accept donations of land, funds, and other aids to the development of its program.

Ten members shall constitute a quorum of the board of directors and shall have power to transact all business of the board.

The board of directors shall, within 30 days after adoption of this constitution, provide itself and the federation with a set of bylaws, which shall be subject to amendment in the same manner as provided herein for the amendment to the constitution, except that the bylaws may be amended by a majority vote.

Officers of the board: The board of directors shall choose from among its membership a chairman and vice chairman, who shall hold office for 1 year only, unless reelected by the board.

The board shall have the power to select a secretary who may or may not be one of its members. The person so selected should have an adequate knowledge of wildlife conditions and be familiar with conservation organization activities.

The secretary shall hold office at the will of the board of directors and shall furnish bond in an amount stipulated by the board for the faithful performance of his duties as secretary.

The board shall select annually a treasurer whose duties are hereinafter defined. The treasurer shall furnish a bond in such amount as the board may stipulate for the faithful performance of his duties as treasurer.

ARTICLE V. OFFICERS OF THE FEDERATION

The federation shall elect annually, at its conference, a president and three vice presidents, all of whom shall be members ex-offico of the board of directors.

There has been no change made in page 5:

The federation, at its annual conference, may, if it so desires, elect a president emeritus, recognizing some individual who has rendered a conspicuous and outstanding contribution in the field of wildlife.

ARTICLE VI. NONAFFILIATED MEMBERSHIP

In addition to the representatives who shall make up the general wildlife federation, individual memberships may be obtained by persons and groups not affiliated with any of the other groups, societies, or clubs which make up the county and State federation. Such memberships may be obtained under rules and regulations provided by the board of directors.

ARTICLE VII. EXECUTIVE COMMITTEE

The board of directors shall appoint from among its own members an executive committee of seven members which shall have such power as may from time to time be delegated to it by the board of directors.

A majority of said members shall constitute a quorum. Vacancies in the executive committee shall be filled by the board of directors. Vacancies in the board of directors shall be filled by the remaining members. Persons so selected to fill vacancies on the board shall hold office only until the next annual meeting of said board, unless reelected as herein provided.

ARTICLE VIII. FINANCE COMMITTEE

The board of directors shall appoint a finance committee of seven members which shall be selected from the membership of the board of directors, four of whom shall constitute a quorum. The finance committee shall have the power, and it shall be its duty, to recommend the method and devise the ways and means for securing adequate revenues to finance the operations and activities of the general wildlife federation, including the cost of the annual conference. Within 30 days after the adoption of this constitution, the finance committee shall present to the board of directors a plan for such financing.

There is also no change on page 6:

ARTICLE IX. OTHER COMMITTEES

The board of directors shall appoint a program committee, which shall have in charge the preparation of the program for the annual conference of the federation, the issuance of the call for said conference, and all of the details incident thereto.

The board of directors shall appoint a legislative committee, which shall cooperate with the States in legislative programs and assist in bringing to the attention of the National Congress the needs and requirements of wildlife.

The board of directors shall appoint a planning committee, which shall assist in developing a wildlife restoration and management program. The planning committee shall present its data and conclusions from time to time to the board for distribution to the public and interested agencies.

The board is empowered to appoint such other committees from time to time as the need for them arises.

ARTICLE X. OTHER OFFICERS AND EMPLOYEES

The board of directors shall have the power, in addition to employing a secretary, to employ such other special service assistants, officers, and clerical assistants as from time to time may be required to carry on the work of the federation and render the service for which this federation is formed. Neither the president nor the vice presidents of the federation, nor the chairman or the vice chairman, shall receive any compensation, except for expenses authorized or approved by the board of directors.

The board shall fix the compensation of all its officers and employees

On page 7 we find a change. In order to clear up the matter of how voting is to be done at the conference, an additional article

has been inserted. This will be article XII, and the original article XII will become article XIII.

Article XI has not been changed, and reads as follows:

ARTICLE XI. DUTIES OF THE OFFICERS

The president of the federation shall preside at the opening of the annual conference of the general wildlife federation and shall perform such other duties as are germane to his position.

The vice presidents of the federation, in their order of precedence, shall preside in the absence of the president, and shall, in case of a vacancy in the office of president, succeed to that office.

The chairman of the board of directors shall preside at all regular and special meetings of the board, and shall perform such duties as the board may delegate to him. The vice chairman shall, in the absence of the chairman, preside at any meeting of the board, and shall have such powers and shall perform such duties as the board may delegate to him.

The secretary shall have such powers and shall perform such duties as the board of directors may from time to time impose upon him. He shall receive all moneys coming to the federation and shall, after entry on the federation's records, turn same over to the treasurer. He shall issue the call for all meetings, shall keep all records and otherwise conduct the affairs of the federation under the direction and supervision of the board.

The treasurer shall be elected annually by the board of directors. He shall receive from the secretary all moneys which are collected by, or turned over to, the secretary. He shall pay all indebtedness incurred by the federation out of said funds when evidences of such indebtedness are submitted to him with the approval of the secretary.

This is the new article XII:

ARTICLE XII. VOTING AT CONFERENCE

Voting at the conference shall be by States, each State being entitled to one vote. Nation-wide organizations and societies shall likewise be entitled to one vote for such organizations in their respective regions as hereinbefore provided. Representatives may vote in person or by proxy, and it shall be the duty of the board of directors to require proper credentials from all who appear as representatives.

ARTICLE XIII. AMENDMENTS

This constitution may be amended in the following manner:

1. Not less than 60 days prior to the annual meeting, amendments may be proposed by any representative of the federation, or any county or State group, or any individual member, by filing same with the secretary of the board of directors.

On page 8, in paragraph 2, in the second sentence, a change has been made, so that the page now reads:

Not less than 45 days prior to the annual conference, the secretary shall transmit to the officers of the 48 State federations, and to such other national and individual memberships, copies of said proposed amendments. At the annual conference these amendments shall be submitted to the membership in attendance, and if approved by two-thirds' majority of those voting, shall become part of the constitution.

2. Amendments to this constitution may be proposed at the annual conference of the federation and within 30 days thereafter shall be transmitted by the secretary to the board of directors to the State wildlife federations for approval or rejection. When the secretary has been advised by mail by the officers of two-thirds of the State councils that an amendment has been approved, he shall notify the board of directors, which shall in turn promulgate the amendments as a part of the constitution.

Mr. QUINN. You have heard the reading by the secretary of the proposed basis for the constitution which may be eventually adopted

when we are officially recognized as the General Wildlife Federation. At this time, therefore, I shall entertain a motion for the adoption of this basis for the States' consideration.

Mr. L. A. Colby (Chicago). I move the unanimous adoption of this constitution as herein presented. (Seconded.)

Mr. Quinn. The motion has been made and seconded that we do by unanimous vote adopt this basis.

(The question was called, and the motion unanimously carried.)

(Copy of constitution as finally approved is bound in back of this volume.)

Mr. Quinn. As yet we are not an official body, so there is nobody to receive formally resolutions to be presented, but your committee awhile ago did, and, if you will allow me, I will read this resolution for your consideration as an independent body of delegates to this wildlife conference:

Resolved, That wildlife conservation and restoration be recognized as a fundamental duty of all agencies of Government, local, State, and National, and that we, the participants in this wildlife conference, commit ourselves to the responsibility of bringing to the attention of all citizens, both private and official, the objectives herein set forth.

I move the adoption of that resolution.

(The motion was severally seconded.)

Mr. Quinn. Is there any question? All in favor of the resolution will signify so by saying "Aye." Those opposed, "No." The resolution is adopted.

I am going to ask the secretary, Mr. Shoemaker, to make the announcement for the Committee of Thirteen nominated for acting officials of the General Wildlife Federation as set up in the basis of the constitution previously unanimously adopted by this conference.

Secretary Shoemaker. I would like to be able to make a spread eagle speech for the name which has been proposed for acting president of this great federation. The committee proposes for president, Jay N. Darling.

(Those in attendance arose and applauded.)

Chairman Darling. All that means is work.

Mr. A. F. Foran (Flemington, N. J.). I would like to second that nomination on the part of New Jersey.

Mr. Quinn. The nominations are closed. All who are in favor of electing Jay N. Darling as acting president of the General Wildlife Federation will signify by rising.

(All those in attendance arose.)

Mr. Quinn. All who are opposed—yonder is the door.

Secretary Shoemaker. The nominating committee proposed three names for the three vice presidents. It very wisely selected these from the several regions of the Nation.

In nominating the man for the eastern region, region no. 1, the committee again, in my estimation at least, showed great wisdom. It selected the Honorable Frederick C. Walcott. [Applause.]

For the vice president of the second region I can only repeat the same words: Mr. I. T. Quinn. [Applause.]

And from the great West, the out-of-doors, they have selected our own beloved—my fellow townsman—W. L. Finley. [Applause.]

Do I hear a motion?

B39649

A, Mallards near Nisqually, Wash. (Biological Survey photo.)

B3031M

B, Mixed company—mallards and pintails. (Biological Survey photo.)

B38376

A, Adult Richardson's grouse near Enos Lake, Teton County, Wyo. (Biological Survey photo.)

B5030M

B, Tepee corn-shock feeding station for upland game birds. (Wisconsin Conservation Department photo.)

Mr. WILLIAM J. TUCKER (Texas). I move you, sir, that the nominations be closed.

(The motion was seconded, voted upon, and carried.)

Mr. QUINN. All in favor of the nominees as here presented will signify their assent by saying "Aye." I am not even going to put the reverse. The nominees have been elected.

We should like to have a report on the roll call of States from a representative, perhaps the chairman of your State delegation, at this conference, to just rise and answer "Yes" or "No" to the question of whether or not you have set up already, or have taken steps to set up, a federation within your State prior to the convening of this meeting. I am going to ask Mr. Shoemaker to call the roll of the States. Just simply rise and answer "Yes" or "No," so we can get the names of the States that have either completed or have taken steps prior to this conference to complete their State federation.

(In response to the calling of their names the states replied as follows:)

Yes: Alabama, Arizona, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Washington, Wisconsin.

No: Arkansas, California, Colorado, Connecticut, Delaware, Louisiana, Maine, Massachusetts, Mississippi, Montana, New Hampshire, New Mexico, North Carolina, South Carolina, South Dakota, Utah, Virginia, West Virginia, Wyoming.

Secretary SHOEMAKER. All but two States, Tennessee and Vermont, are recorded.

Mr. QUINN. We are much obliged to you for that information. It looks as though you are doing some work in the States. That is a fine report.

At this time I am going to recognize Acting President Jay N. Darling.

REMARKS BY PRESIDENT DARLING

Chairman DARLING. Thank you, Mr. Quinn; and I don't know whether to thank you or not. I know what you are trying to do; you want somebody to do the work for you. I will do my best! [Applause.]

We have, as you know, the Republic of Mexico and the Dominion of Canada associated with us in this conference. Most of our relations with those two sister republics must be handled by a technical committee who know where to step. We don't want to do anything rash that does not conform with the cricket things to do internationally. I wouldn't know how to go about it, and the first thing I want to do is to appoint an acting committee which may consider the international relations, to whom all international problems may be referred.

COMMITTEE ON INTERNATIONAL RELATIONS

On that committee, with your consent, I would like to name Mr. Alonzo Stewart, from the United States; Mr. J. B. Harkin, from Canada; and Señor Juan Zinser, from Mexico. I will entertain a motion that the committee be confirmed.

Motion by Mr. David A. Aylward

Mr. David A. Aylward (Cambridge, Mass.). I move the confirmation of the acting committee.

(The motion was seconded, voted upon, and unanimously carried.)

Chairman Darling. We have in our midst men who have worked incessantly toward the accomplishment of the aims and ends which we have sought and accomplished today. I would like to call on many of you, and many of you would like to hear each other, I know. There is not time for that, and this is going to be a little unfair to the people upon whom I call, but I have never known them to fail to rise to a responsibility.

I told you this morning of the origin of the Wildlife Institute, how it came about, and why we had to have it. The man who took the load of that thing accepted it under protest, as he has accepted any honorary thing, but he has always done a work, whether there was any honor connected with it or not—any official honor.

His convictions are sterling and well-founded in conservation. I know of no better in the United States, and I will stand up for him from hell to breakfast, as the saying goes. I want him to say a few words to this audience on conservation.

Mr. Quinn. Presenting Mr. Beck, of Connecticut. [Applause.]

Remarks by Mr. Thomas Beck

Mr. Tom Beck. My good friend Jay Darling is altogether too complimentary, but I accept what he says because I know he says it with conviction and sincerity, and I sincerely hope that as time goes on I can live up to his good opinion of me and the work that I tried to do.

I would rather say to you at this moment, perhaps the only opportunity I shall have ever to talk to such a large group of people interested so deeply and so thoroughly in this important subject, that I have never been, in all of my experience in conservation and restoration, more encouraged than I am at this moment. We are set to do things and to go places, and I am sure, with the intelligence that is here and with the numbers that are represented, not only on the floor but back home, we are bound to succeed.

I would like to leave one other thought with you, and that is this, that the subject we have to do with here today and in the other days of this conference and in the future, is vastly greater, vastly broader, than the mere restoration of mammals and birds, or of wildlife species. It is the protection of the future generations of this country; it is the protection of the land, the soil, the business of agriculture, the forests, the streams, the whole business—it is the protection of these United States of America [applause], and I know that the future of this country in the matter of restoration and conservation, of mammals, birds, environment, soil, water, and all, is safe in the hands of an organization such as you tentatively set up today under the leadership and presidency of a man whom we all admire for his energy and his intelligence, his enthusiasm and his patriotism, Jay N. Darling.

Thank you. [Applause.]

Chairman DARLING. This isn't supposed to be an exchange of bouquets.

I do know that many of you in the general audience are strangers that I have never seen before, and I also know that you want to know the people who have come up in this work during the last few years. I don't want them to take much time to speak. I just want them to come up here and say "How do you do?" and wish us luck in our new venture.

There is one man whom I have learned to love and admire and work with. We don't always agree, but we never fail to be honest with each other. He is a dynamo of energy—Mr. John H. Baker, of the Audubon Societies.

Mr. QUINN. Presenting Mr. Baker. [Applause.]

REMARKS OF MR. JOHN H. BAKER

Mr. JOHN H. BAKER. Ladies and gentlemen, I wish to pay tribute to the magnificent ideals of our acting president in the set-up of this federation to bring about cooperative action. The Audubon Association is fighting for the material, social, and recreational welfare of all the people. We pledge our cooperative action in endeavoring to bring to fruitful ends the action of this federation here formed.

I am sure that there are some of the sportsmen present who have not an understanding of the objectives of the Audubon Association, and I pledge them our every effort to bring about that cooperative understanding of each other's point of view and problems which is necessary to the success of this venture. [Applause.]

Chairman DARLING. Thank you.

This is going to be mean on this fellow. He won't like it, but I am going to call on him anyway. He is president of the International Association of Fish and Game Commissioners. Mr. Elliott Barker, of New Mexico.

Mr. QUINN. Mr. Barker is not only president of the International Association of Game, Fish, and Conservation Commissioners; he is, too, the president of the Western Association of Game and Fish Commissioners [presenting Mr. Barker]. [Applause.]

REMARKS OF MR. ELLIOTT S. BARKER

Mr. ELLIOTT S. BARKER (Santa Fe, N. Mex.). The president has been most unfair, I think, in calling upon a man of my limited abilities as a public speaker to make any remarks extemporaneously.

I just want to say one thing, however, that to my mind, if all of the words that are uttered annually on behalf of conservation, and if all of the resolutions that are passed at the various conventions that are held as wildlife conservation conventions, could be converted into real, effective action for the benefit of wildlife, there would be a decidedly different picture of wildlife over this country today.

If this tentative organization that has been set up here today for ratification by our people back in the States only serves as a means to produce more words and more resolutions, it will have failed

dismally. What we need is more action, more direct action, more actually getting the job done, and unless this new organization or federation can serve that purpose, then I can see no good in it.

I sincerely hope that it will be a success. I can see a great many troubles ahead, but I sincerely hope that we can make it a success, that we can all cooperate and make it go. I personally am going to do all that I can to make it successful out in our western country. But if we are not going to operate on the basis of actually getting action instead of mere words and resolutions, then all of our efforts will have been in vain.

I thank you. [Applause.]

Chairman DARLING. We have, among the eastern delegates and silent men who have looked forward to this day and cooperated, the president of the Izaak Walton League, the National Association of Izaak Walton Leagues, Judge George W. Wood. Where is George Wood? [Applause.]

REMARKS OF HON. GEORGE W. WOOD

Judge GEORGE W. WOOD (Iowa). Ladies and gentlemen, I have a deeper interest, perhaps, in the organization than any of you because of the long personal contact with the man that has fortunately become the acting president of this organization. Those of you who do not live in Iowa do not know what it means to have a Darling cartoon every morning for breakfast.

In our State he has always, and at all times, upheld the things that are the highest and the finest, and in bringing his splendid talents to a wider field those of us from Iowa know that a splendid crop is going to be harvested.

We of the Izaak Walton League have been working earnestly for many years to do the things that you have had depicted here so brilliantly and so forcefully upon this platform. Personally, the interest that I have in this thing is even a wider one, because my particular line of activity has been in trying to stem the social break-down of the community in which I live and of the State in which I live, and I want to assure every one of you delegates here that if you go home and put into the organization of this federation that is so necessary to the saving of the beauty and the wholesomeness of our out-of-doors everything that it deserves, every dollar and every ounce of energy will be more than saved in the expenditures which are being made through our correctional institutions—all too unfortunately.

I do not need to pledge to Jay Darling the support of the Izaak Walton League or of myself personally, because he knows he has that to the fullest extent, and he always will have, and I am sure that were you as fortunate as we are in Iowa in having the cartoons for breakfast, the inspiration that you would get would be a wonderful thing for the influence of the social order in the United States of America. [Applause.]

Chairman DARLING. In addition to all the other things that I have had there have been scores and scores of telegrams from those people out in the States who could not get here. All of them have expressed good wishes, congratulations, and a general enthusiasm over the undertaking which we have started in this meeting. The

message I just got from the press table I think caps the climax of all of them. It says:

> The bowlegged girl of the village has at last been invited to the picnic.
>
> (Signed) JIM STUBER, *Ohio.*

[Laughter.]

You know, the one thing that I am most grateful for is that we have avoided the controversial issues. We have avoided getting sidetracked on to things which might have ruined the possibilities of success. There are many things which we might undertake, but I don't think we should. I think we should keep our aim straight down the middle of the aisle, and I hope we may never get on to those side lines. There is too much of importance to be accomplished on a straight line without being diverted.

I know of no man who has a more single eye to that objective and who has contributed more and who was the original chairman of the President's committee than F. A. Silcox, Chief of the Forestry Service. I wish Mr. Silcox would step up here and close this discussion. [Applause.]

REMARKS OF MR. F. A. SILCOX

Mr. F. A. SILCOX. I am beginning to realize what it means to be chairman of a conference of this sort and to try to get banquet arrangements and all the side-line mechanism for the conducting of a conference of this size. I just had a call from the Hotel Mayflower stating that there would be close to a thousand people at the banquet tonight, which shows an amazing interest in this whole problem of wildlife.

May I make this comment, having sat on the side lines while this discussion has been going on: It is an exhibition, once again, of the Americans' tremendous capacity to function in a democratic way. With all the cross currents, undercurrents, whirlpools, and rapids that existed in this whole wildlife situation, which caused me very definitely some hesitancy in accepting the job of the chairmanship, I have been watching today this particular performance of a group of Americans in getting together with some sense of unity in a problem that is so vital to us all. I have watched your delegations go into action as a group selected by yourselves and function in a definite, democratic way. I have been very glad to see that you have taken the matter into your own hands and kept both State and public agencies out of your organization.

I say that for this reason, that is chief of one of the bureaus here in Washington, the thing that I hope to avoid more than anything else is to have a bureaucracy become selfrighteous, arrogant, and case-hardened. I think the most priceless possession that we have in the United States is our democratic institutions, our opportunity to discuss among ourselves, to wrangle across the table—the right of free speech, the right of free assemblage and, out of it, to evolve a solution of our own problems. And I want to see that preserved no matter what our future problems may hold for us.

I hope that those of us in America and in the United States will fight to preserve that above everything else. I consider it a whole lot more important even than the restoration of wildlife, because without it wildlife stands a pretty poor chance.

So I have been watching this performance on the part of this particular delegation that came to Washington on very short call. This whole wildlife conference was initiated in the latter part of December, and the President, being vitally interested in it, requested you all to come in. You have given generously of your time and efforts and energy and interest in this whole thing and, under the masterful leadership of "Ding" Darling this morning I watched this group go into action to try to get somewhere in a practical program which will unify, again, the various sectors who have been courageously carrying on in this whole field of wildlife, to get them into some unified program which will make their efforts a whole lot more effective.

I hope that out of this will grow a permanent organization and that we won't see this whole movement which has been gathered together here, and which has exhibited such enthusiasm, go back home and forget to take up this matter with the local groups, because this whole program which has been outlined and has been stated to you in clear terms this morning and this afternoon has got to evolve from the bottom and not from the top, and I hope to see out of it an integration of the State agencies, Federal agencies, the private citizens of the United States who feel that there is a tragic situation concerning our wildlife resources, and we want to cease to hold simply conversations about it, and get some practical action which is going to save the environment of our wildlife resources.

As Americans we have been inclined to take a bite out of the apple and throw the rest of it away. We have overdrawn our account in a thousand and one places. We have to reinvest in our rivers, in our forests, in our environment, to restore our wildlife, and I feel that if you tackle this problem of wildlife you have touched, inevitably, the question of water, the question of forests, the question of land, the question of feed, and you cannot be active in the problem of wildlife without seeing that the whole matter of conservation is discussed.

I am going to close this by merely mentioning one of "Ding" Darling's cartoons which has always stuck in my mind, which contrasts the care and restoration of environment as against the depletion and destruction of it. You remember the cartoon on the "Old Swimming Hole", where a boy was sitting on the side of a river, fishing in a stream, where a tree stood close by, the water was clear and the kids went swimming.

You remember when the chap who had grown up to manhood came back to look for his old swimming hole, he found the tree cut down, the grass gone, and some carcasses of old automobiles thrown into the swimming hole.

That cartoon stands out in my mind as dramatizing the whole problem of conservation in two pictures, and those of us who are here are interested in seeing this country of ours once again support game population, give us recreational enjoyment, and clarity of our streams, despite all of our industrial development, and with it, a protection of our environment and the use of our natural land resources in a way that we can have part of the abundance that once existed in this country.

I want to express my appreciation, before I sit down, to all of you who responded to the invitation expressed in the President's name to attend this conference, again on such short notice. I feel that

out of it is going to come a charter today for wildlife in the United States and on the North American continent.

I hope that all get seats at the banquet, which will be held at the Mayflower tonight. I was just called up, as I told you, and already the list is around 900 who will attend the banquet, and I have been amazed at the tremendous interest that has been shown by delegations from all over the United States and Canada and Mexico in this whole problem of wildlife, and I am tremendously heartened, and a group of us, I hope, can take your message back to the President, telling him of the tremendous response which you have given as citizens of the United States to his call, an emergency call, if you please, for the protection of wildlife in the United States. [Applause.]

Motion Thanking President Roosevelt

Mr. F. C. Walcott (Norfolk, Conn.). Before we adjourn this meeting I would like to offer a resolution, as follows: That we express our heartfelt appreciation to the President of the United States for calling this conference; that we express our appreciation, also, to Mr. Silcox for the extraordinarily able work he has done in making it all possible.

(The motion was seconded.)

Chairman Darling. In effect the resolution is to express our sincere appreciation to the President of the United States for his calling of this conference, and your thanks to Mr. Silcox for acting as chairman of the committee which prepared the way for us.

(The motion was voted upon and unanimously carried.)

Chairman Darling. Among the other people who have served and whom we ought to hear from, if it were possible, is Ira N. Gabrielson, new Chief of the Biological Survey. He is going to make a better Chief of the Biological Survey than I ever could in my life. He is ill. He has worked himself sick on this job.

Then there is Frank Bell, of the Bureau of Fisheries, and so on down the line; but we can't go into that.

There is one more thing I am going to try to have you do. We have been getting up early in the morning, those folks who have been arranging this program, for a long time. Tomorrow morning at 9:30 o'clock, Harold Ickes, Secretary of the Interior, is going to be here to speak. Please don't embarrass this committee and me and everyone else by coming drilling in here at 10:30, and let him stand up here talking to no audience. For one day come and give the boys a chance to say their minds. Here is a man who believes in conservation. He is always pertinent in the way he expresses himself. Let's get started at 9:30, even though you do go to a banquet tonight.

The rest of the program is excellent. I commend to your particular attention the remarks of John Studebaker, United States Commissioner of Education, who has at heart the extension of the educational program of wildlife and hasn't a ghost of a chance of carrying it out unless you come and support him, and he is always interesting. Don't worry about those two numbers boring you to death. They will be worth getting up for if you have to set an alarm clock.

Unless there are some other important things to come before this meeting I am going to declare it adjourned.

Mr. KENNETH REID (Pennsylvania). I think it is entirely in order that one more motion be made, and that is that we express our heartfelt thanks to yourself for serving as chairman. [Applause.]

Chairman DARLING. That, I think, is very nice of you. My only fear is of my own frailties in not being able to carry it out to the extent of its possibilities, but I shall try my best.

Thank you very much for sitting through this difficult ordeal and supporting all these measures so fully.

The meeting is adjourned.

(The meeting adjourned at 3:55 o'clock.)

WEDNESDAY, FEBRUARY 5, 1936, 7 P. M.

BANQUET

Toastmaster: F. A. Silcox, Chief, United States Forest Service.

Mr. SILCOX. Now that you have finished enjoying this rather delicious menu, we are going to have the national anthems of the three countries represented at this Conference; first the Mexican, then the British national anthem, and then our own.

(The orchestra played the Hymn Nacionale Mexicana, God Save the King, and The Star-Spangled Banner.)

Mr. SILCOX. This has been a remarkable conference so far, in having a large degree of unity in meeting one of our fundamental national problems. The playing of the three national anthems brings us together as three good neighbors living side by side in peace and amity. Here we are as three great nations gathered together discussing our borderline problems, not in terms of armaments, but in terms of birds and game.

The three national anthems played together is of peculiar significance in a game conference of this sort, and I am happy that that spirit of good neighborliness that the President has so well characterized exists along so many thousand miles of border both to our north and to our south.

I am particularly disappointed tonight that the President, who had hoped to be with us, could not come on account of pressing engagements. He has requested Secretary Wallace to bring a message to this conference, a message of good will and assurances of his personal interest in the success of this conference.

I hardly have to introduce Secretary Wallace. He is known to all of you. I have had the opportunity to work close to him, and I want to say while I have the platform and have my advantage over him—usually he has the advantage over me—that one of the fine qualities of spiritual earnestness brought into this whole picture of American life has been brought by Secretary Wallace. [Applause.] It is a rare thing in political life to have that quality of purposefulness, sincerity, earnestness, and spiritual quality combined in one of our members of the Cabinet who has had, as you all know, his difficulties in trying to find our way out on some of our very complex agricultural problems.

I take a great deal of pleasure and delight in introducing Secretary Wallace, who will bring to you a personal message from the President. [Applause.]

Address of Hon. Henry A. Wallace

Hon. Henry A. Wallace. Mr. Chairman, our neighbors to the north and the south, and these thousand lovers of wildlife who have come from all parts of the United States: It is indeed a very great pleasure to bring to you at this time a somewhat informal message from the President because on this occasion I have not been commissioned to bring to you a formal message. I did that a couple of days ago.

I do want to say, however, that the President's interest in wildlife is not a mere formal, a mere official interest, an interest which began with the accession to his present high office; it is an interest indeed of the heart and an interest of long standing, and I am sure that he would have been here on this occasion if it had not been for the altogether unusual press of duties which have come upon him during the past 2 weeks.

Mr. Silcox and our friend Jay Darling have exercised the utmost of their influence to see that the President should come here tonight, and the President I am convinced would have come except for the fact of the omnipresent secretary who sees that the President doesn't do all the things that he would like to do.

I understand that this meeting has been an enormous success. As a matter of fact, I didn't need to be told that. You know, sometimes you come into a meeting and you just sense that things have been going well. The moment I came into the Mayflower Hotel this evening it was apparent from the atmosphere that things had been going well, that you were all friends of each other. That is something to me almost beyond belief. [Laughter.]

Within a very few days after I came down to Washington I was told that the one thing which had given Secretary Hyde more bother than anything else was the problem which arose out of the Biological Survey. The only sample I had had of wildlife was Jay Darling here, and I thought, had I been misled, was this problem so terrible? I began to think maybe this was like the horticultural society used to be in Iowa. Some 40 years ago in Iowa there used to be a great controversy as to whether or not we should grow Russian apples in Iowa or just plain American apples. That is when the red menace first appeared in this country so far as I know—the Russian apple. The horticulturists used to meet every year to debate this exceedingly weighty problem, and an old friend of my grandfather's used to go by the room where they met and he would say, "Look at 'em, look at 'em, all the time fightin', all belly and no chin." [Laughter.]

I visualized that situation, but as I look on this gathering I know that that mental picture that came up in my mind those first few days in my office was altogether false. We did have some uneasy moments. I started out, it happens, with something of a prejudice against the shooters—I might as well confess it. I didn't get fully disillusioned with regard to that particular prejudice until I found out that Jay's good friend, Tom Beck, was a human being. I had had Tom Beck painted to me as one of the most rabid of the shooters, a truly terrible person. I thought, "Well, now, it probably isn't politically feasible, but we ought to show these shooters where to head in." But I discovered after a bit that the so-called shooting gentlemen had as vivid an interest in increasing wildlife, possibly

a more determined interest, than anybody else, and I began to think surely there must be some common meeting place.

Due to the accident of a variety of circumstances and truly great personalities, a great many of which came by way of Jay Darling—and I don't think any of us can ever express adequately our appreciation to Jay Darling—certain formulas began to appear for getting an ever-increasing unity in the things in which all of us are interested and in the sinking of those things which have divided us, and it seems to me it is truly a marvelous occasion this evening that we have given expression in a formal way to these things which have been really existing for perhaps a year past.

You know, sometimes, I think a great deal of money can be made if someone will get together all of the various State papers of Jay Darling, the memoranda which he has submitted to me and the President and various other folks, the drawings which have accompanied these memoranda, the shrieks of anguish which he has let loose not only inside the Government, but outside. [Laughter.] I wonder how long any government could stand up under the internal assaults of Jay Darling in more than one or two bureaus in the Government, but as long as it is serving the greater good I don't know why anybody should kick.

I listened to Jay's speech—was it Monday afternoon—when he was trying to incite you all to revolution of some kind or other, and from now on whenever I see Jay Darling cartoons about how the Government ought to cut down its expenditures—that's all right, Jay, we want to see the farmers and the wildlife get theirs, don't we, anyhow? [Laughter and applause.]

I don't know why just because the wildlife came last on the scene and the farmers came next to the last on the scene we shouldn't get just as good a break as anybody else. But it does seem to me as each particular pressure group begins to press for what it believes to be its own rights, sooner or later we shall all of us begin to figure just what common unity in these United States is.

I think that absolutely everybody who has his hand in the Public Treasury can work out to his own satisfaction just as good a justification as Jay Darling worked out for the ducks. Jay says, "Oh, no", and he said it in a deeply aggrieved and pained tone of voice. I said to their own satisfaction, Jay, not to yours.

I mean there are some folks who think that human beings are just as important as ducks—there are some. [Laughter.]

I have had trouble with that, because I have a boy of some 17 years of age who thinks that wildlife is absolutely the most important thing in the world, and I have spent 2 years trying to convince him that the habits of human beings were just as interesting as the habits of wildlife, with absolutely no success.

I suppose as a matter of routine, because I am one of the bureaucrats here, I ought to say that agriculture and the farmers are very much interested in wildlife, that a lot of the birds eat boll weevils, and that increases our cotton problem. [Laughter.] A lot of the scientists that Jay used to boss and that Mr. Gabrielson now bosses have analyzed the stomach contents of I don't know how many birds and they know just how much the birds are worth to the farmer, and all that sort of thing; and of course the Forest Service has got all kinds of deer and elk and whatnot—I suppose most of

the big game animals are in the forests of the United States. You know that kind of talk as well as I do; I don't know that there is any need of my rehearsing it. I intended to get some of that together. I put down on a little piece of paper this morning to find out something about the history of the Biological Survey, and I forgot to do it. [Laughter.]

As it is, I might as well say, to the chagrin of the Forest Service, that I happened this past summer to see more game in the national parks than I did in the Forestry Service. I see Glenn Smith over here; I suppose he will insist I have to come out and next time instead of showing me some of the grasses on the range he will see that I see some wildlife in the forest. At any rate, I think we will all agree on this: That wherever wildlife is to be found, whether it is in the national parks or in the forests or in Mr. Carpenter's grazing outfit, we are all of us for wildlife. I think we are all convinced of that and we just don't give a hang where it is found and we will all pull together to see that the wildlife gets a break. [Applause.]

I hope some of the reclamation folks are here too and that they will agree with the statement. [Laughter.]

If I might speak in a slightly serious vein for a moment, it seems to me that this occasion marks something deeper than most of us realize. This is one of what I hope will be a series of occasions marking something which is truly deep and significant. I am referring to a gradual moving of interest from the things which have to do with mechanics and machinery to the things which have to do with life.

From the beginning of the nineteenth century, along about 1900, up until the outbreak of the World War, there was the most extraordinary increase in population in the world and the most extraordinary increase in mechanisms, and the use of power, which comes from coal and petroleum and electricity, that the world has ever seen or probably ever will see. As I remember the figures, from 1845 to 1914 the population of England and western Europe doubled, and the population of the United States trebled—a truly extraordinary thing. And during all of that the really great interest of man was the subduing of nature, the increase of control by mechanical means, an expansive era, the exploiting of wildlife, the exploiting of the soil, the exploiting of the things found in the soil, and the first suggestion that that extraordinarily vivid period was coming to an end was furnished by the forces that were set in motion particularly by Theodore Roosevelt and Gifford Pinchot. [Applause.] In some ways it was just merely a kind of broadcasting to the world that things sometime would change. Much of it some people thought was mere enthusiasm, although when I traveled over parts of the West this summer and saw how deeply Gifford Pinchot had implanted his ideals in the hearts of many, many men with whom I met, I realized that that movement at its very inception had in it something of extraordinary long-time vitality.

Now as our interest shifts to life more and more as contrasted with machines, we will find it necessary to make our emphasis in rather extraordinary fashion, not that we will in any way suggest the lessening of inventions, of machinery, the utilization of power; as a matter of fact we covet all the leisure that those things will

bring us, but we also covet the use of that leisure for the things that have to do with life and with living, with every kind of life, not merely human life. You can't tell when the most insignificant form of life will come to have an unusual value, the most insignificant form of plant life, if you please, the most insignificant form of microbe or of fungus growth or animal. Every form of life may conceivably eventually have some kind of value and interest, and we would hate to see any form of life absolutely and utterly extinguished until it had been examined in all its aspects with the utmost care, because when certain of these forms of life pass away they will never come again.

Of course, the Biological Survey has studied in very great detail certain types of balance between different forms of life, and around that study of balances many controversies have been raised. The verdicts with regard to these balances will change from time to time as our knowledge increases and as our economic relationships change, and I certainly wouldn't get into that field on an occasion of this sort at any rate.

I would like to throw in this little brief word with regard to some of the things which have grown out of the Agricultural Adjustment Administration and will grow out, I believe, of the new administration, which will be called—let's see, we want to get this new alphabet correct; I think the way they have got the bill labeled is something like this: Soil Conservation and Domestic Allotment Administration. In any event, I think that out of that administration can grow a number of things of very real significance to wildlife, because the very heart of that approach is a conservation approach, the putting, I would guess, of roughly some 30 million acres of plow land into grass, into trees, into soil-building crops, and I would trust that some of those crops would bear seeds that would be good for quail in many localities, that there would be certain shrubs that would have seeds—Jay Darling has told me all about these shrubs that have seeds that are good for wildlife. I hope that some of the Forestry folks are listening to this, Jay. We hope that some of these 30 million acres will find their way into these things that will have seeds that can be used by various types of upland game at any rate, during the winter time especially.

As we contemplate the great variety of agencies which can realize the fact that wildlife exists, as we contemplate how easy it would be for them to make slight modifications in their program without damaging their major interest, we can recognize the possibility of, I would think, doubling or trebling certain types of wildlife within the next 10 or 15 years. Maybe we can have the wildlife population increase at as fast a rate during the next 15 years as the human population of the United States increased during a hundred years. When we consider that it takes a man 20 years to reach maturity and the average form of wildlife not more than 2 years, the relationship might be altogether within the realm of possibility if the means of sustenance were there, as the means of sustenance can be there if we divert some of this land which is apparently not needed for human beings at the moment into wildlife purposes.

Yes; it ought to be possible to have a situation which would redound to the use of wildlife, redound to the long-time welfare of the soil, and if the time should come when we would need that soil for

the purposes of sustaining human beings to good advantage, either in this country or in the world as a whole, the soil would have benefited from the rest. After all, in the long run it is human beings that must be served.

I would like to say just the briefest word about recreation as an economic asset. Jay thinks that I just don't have any appreciation whatever of wildlife as an economic asset. He comes around with all kinds of ideas as to how you can raise a thousand dollars' worth of muskrat fur off of an acre, and things like that. I take all those figures of Jay's with a grain of salt. I think he is an awfully good cartoonist. [Laughter.] I don't think quite so much of him as an economist. But I'd like to show him how to justify his wildlife from an economic point of view, because I think he can do it. I don't think he has gone at it the right way.

Of course, that is all right to have a lot of muskrats and get the fur and all that sort of thing, that is all to the good, but I think the greatest value of wildlife in the long run is going to come from the recreational aspects which wildlife ministers to. I am not turning thumbs down at all on this shooting business. It is all right as long as the shooters are like Jay Darling, and a lot of shooters I know are. But there are others that aren't like Jay. Jay says they can't hit 'em. But there are certain rules of the game which we all recognize should be observed.

All of us do recognize, I think, that there is a recreational aspect to wildlife which applies not only to the shooters but also to the appreciaters, and those of us who don't belong to the ranks of the shooters are always delighted to see the rather extraordinary fashion in which the shooters as they get older become appreciaters from the very depths of their being. And to Jay, who was once a shooter first and foremost, and who has been an appreciater, to Jay Darling belongs credit, in my opinion—and in some measure to my friend Tom Beck over here who also is a shooter—perhaps more than to anyone else for drawing all groups into the splendid control of unity.

I was going to say just a little about the economic value of the recreation aspect. You know these children that are coming on now who have been trained in the schools toward appreciation are so much different from the children that most of us knew when we were young that there is just no comparison. They have an extraordinary appreciation of the out-of-doors. I suppose the percentage among the children is ten times as great now as among the children 30 or 40 years ago, and they are going to pay money to live in cottages in certain place, to live in hotels in certain places, to live under very primitive conditions and hire guides in certain localities.

I have forgotten what Mr. Silcox told me about the value of the recreation industry in Maine; I think it was $100,000,000.

As these captains of industry finally become aware of the fact that they are extraordinarily efficient in turning out the material goods of life and get over this idea of thinking that they have got to accumulate surpluses of billions and billions of dollars—last year they accumulated a surplus that they didn't declare in dividends of over $3,000,000,000, hoping to use that as a reserve, hoping to use that in more efficient ways to turn out the old familiar material goods of life—and as they turn their attention to the things that are coming more and more to represent the desires of the oncoming

generation, then this whole recreational thing related to wildlife and the beauties of the out-of-doors, whether it is wildlife or whether it is inanimate nature, will be realized. [Applause.]

Remarks of Chairman Silcox

Chairman Silcox. When Secretary Wallace was invited to attend this dinner tonight, he took notes from the Biological Survey; but he did not use them; he did this entirely extemporaneously, and we are delighted he did it that way. He has gone over a number of fundamental subjects that are running in the minds of the people of the United States, and it is time we did some rather realistic thinking on the matter of life and living rather than dealing purely with mechanics and watching our toys work to the extent of turning out more and more goods and more and more people hunting for leisure.

I am delighted that after his rather humorous approach to the subject he let his mind play over some of the more serious aspects of things in America about which we are all thinking and that are close to our hearts.

We have with us tonight a gentleman from our northern border state—the country of Canada—who is associated with one of the most glamorous and romantic groups of men in the world, the Northwestern Mounted Police they were once called.

In "Rose Marie", in which Nelson Eddy and Jeannette MacDonald are singing their parts, the Royal Canadian Mounted Police, as they are now called, are dramatized.

I said to Sir James MacBrien that it seemed to me his name was a very happy combination of Irish and Scotch. I had heard of O'Briens, but I had not so far met the MacBriens.

I will have to tell one little humorous incident that occurred tonight. A chap was trying to get the names of those at the head table, and he came up and asked Sir James, "Who are you?"

Sir James picked up the program and passed it over to him. He looked at it and saw "General Sir James MacBrien," and he almost collapsed. He said, "Ooh!" in great reverence.

Sir James is visiting us here in the United States and is interested in many subjects beyond wildlife. He is the Commandant of the Royal Canadian Mounted Police, an organization whose morale has been outstanding in public service not only in Canada but in the world. We are happy to have him with us here tonight. I am almost tempted to introduce you as "Sir Jimes" of the Royal Canadian Mounted Police. [Applause.]

Address of Gen. Sir James MacBrien

Gen. Sir James MacBrien. Mr. Chairman, Your Excellency, Mr. Secretary, ladies and gentlemen, I thank you sincerely for your reception. It is with difficulty that I rise and stand after the wonderful hospitality extended to me particularly tonight but also during the past few days. I also rise with great diffidence to perform my task of addressing such a brilliant gathering as this. I have been struck during the past few days by that very high standard of oratory displayed and possessed by the various speakers who addressed the several meetings at which I have been. That doesn't

warm me to my task at all tonight. Perhaps the contrast, if it is not already evident, will be very pronounced later on.

You would not expect one of my profession, that of soldiering and police work, to speak with ease or facility. As a matter of fact, in our country if a soldier speaks too well he is regarded with suspicion. [Laughter.] Yet I belong to the Royal Canadian Mounted Police, which is often described as the silent force. Just why, I have never been able to discover, but as far as its present Commissioner is concerned it is true as I am rather inarticulate, but I find it easier speaking in the United States now than I did a few years ago, because I find now I can speak just as the spirits may move me. [Laughter.]

Our delegation is very sensible of the honor conferred upon it tonight, conferred upon our country, Canada, conferred upon the force which I have the honor to command, by asking me to address you. I have been deputed to this task by the leader of our delegation, Mr. Harkin, because I think he has the idea that with my force at my back I may be able to protect myself from any onslaughts that may take place. Nevertheless, he may have some difficulty at home with my force for having imposed such a hard task upon me when away from home and unprotected to some extent.

The reason I think that Mr. Harkin has asked me to speak on behalf of the Canadian delegation to you tonight is to describe briefly the work of our force as the chief agency in our country for the enforcement of all laws in connection with wildlife. We have another form of wildlife in Canada which is our first duty, that which goes with alcohol and gasoline and other stimulants of that sort. That isn't the kind of wildlife that I am going to refer to tonight in particular; it is the wildlife that you are all more concerned with here in this gathering.

Ours is a Federal force, or Dominion, as we often call it, and therefore we have a very wide jurisdiction. Our jurisdiction extends to every corner of our large country, from the Atlantic to the Pacific, from our common boundary northward to the Pole; therefore, we have a lot of scope for our activities and a lot of scope for the wildfowl and other game that we have the task of protecting.

Then also our force, as well as being a Federal force, is a provincial one, as we perform the provincial police work for six of our nine Provinces. Therefore, we enforce in those Provinces their game laws as well as any measures that the Dominion Government may enact for the protection and conservation of wildlife. So our duties in that respect, you see, are important, and we have all the jurisdiction that any force could ask for.

Our organization is suited to do the work well. We have our headquarters at the capital. We divide the country into 14 divisions. Those divisions are subdivided into thirty-odd subdivisions, and we have over 500 detachments placed or located where we think best in order to carry out our several duties.

We have a fleet of 500 motor cars, 110 vessels; unfortunately we have only 300 horses nowadays—we have had to give up a great number of them, and we actually have more sleigh dogs, which

we use in the North, than we have horses; we drive about 500 dogs in the winter, and a lot of our patrols in connection with the protection of wildlife are carried out by sleigh or in the summer by boat. That gives you just a rapid sketch of the extent of our organization, the total strength of which is about 3,000. We have a little navy of our own on the Pacific, the Great Lakes, and on the Atlantic chiefly, where we cooperate very closely with your Coast Guard Service in the prevention of smuggling of alcohol and narcotics. Strange as it may seem, the flow of alcohol is northward now and not southward.

I have at my command a force of land, sea, and air, as we also employ regularly about 10 airplanes in our work.

That is the organization at the disposal of the Canadian Government for the protection and suppression of wildlife.

We enforce all Federal laws, and our international Migratory Birds Convention Act is very important. We have taken a great deal of interest in that since its enforcement was handed over to us, and these 500 detachments are kept quite busy at certain seasons of the year enforcing that Act. I must say that some Canadians are of the opinion that we are doing you a very fine service in enforcing that act so thoroughly, because when the birds get big enough to fly they head south before we can get a shot at them. [Laughter.] It is said that 70 to 80 percent of the wildfowl which you either preserve or shoot in your country—preserve from now on I presume it is going to be—are bred up in Canada, and Dr. Allen on my right has been up there photographing and screening and recording their bird notes and no doubt will show you some of them tonight.

Just to summarize our work, we enforce the provincial laws as well. We can go, and do go, into the Provinces and enforce all their measures protecting the game.

The most interesting part of our work that I didn't mention is the northern work. In the Northwest Territory, in the Yukon, further north where the birds go and breed, our men are there at every important junction of a river or lake, wherever there is a settlement, to look after the wild game of all description that may be in that part of the country.

We also help police all our national parks and bird sanctuaries. We issue licenses in many parts of Canada, and we collect all fur tax practically that is collected for the Dominion Government and the territories in the Yukon and also for the six Provinces that I mentioned.

We assist, too, the Department of the Interior in its educational work with the whites, the Indians, and the Eskimos. We supervise quite closely the work of the trappers, their trap lines, the traders, we even watch the missionaries [laughter], the explorers, and prospectors, and others, and even the scientists who go up there we keep in close touch with.

You see that most of these 3,000 men scattered over Canada have the duty of game wardens. They have the task of enforcing all game laws which are, for the most part, entrusted to us. We hope that we do it well. We are striving always to do it better. This is an interesting part of our work. It takes our men out into the

B41262

A, Wire trap at Malheur Migratory Bird Refuge, Oreg., used in catching wild ducks for banding. (Biological Survey photo.)

B38959

B, Banding a wild goose at North Eastham, Mass. (Biological Survey photo.)

B35193

A, A bobwhite quail and its shadow. (Biological Survey photo.)

B29133

B, Fourteen bobwhite quail eggs in nest. (Biological Survey photo.)

wilder parts of the country, and that is what they enjoy most. It entails much patrol work, of course, particularly in the summer when we use small motorboats and travel immense distances in that connection.

Just a few general words about our force that I hope may interest you. Years ago young men used to join the force to seek adventure. They now join seeking a career. We realize that police work is a career nowadays. Still a large number do join to seek adventure, particularly in the northern service and in the preventive service. Although we have lost a good deal of the glamor that went with our force, yet the work of the force presents a great variety, such as the general police work that goes on every day throughout the whole country, the criminal investigation work with its various branches, and now its scientific branch. That is one reason I am in Washington—to learn what I can from Mr. Hoover's most excellent Department of Investigation.

Then we have our marine section with its vessels patroling, as I mentioned before; we have our northern service, and we have our preventive service for the prevention of smuggling.

A young man can make it his life's career, as most of them nowadays do, and he can specialize in any branch that he likes. We are taking legal men onto the force, we are training some in legal duties; we are taking some of our own young bachelors of science who join the force and we are refreshing their knowledge and putting them on the scientific side of this work, endeavoring to bring the work of our force up to date.

Our life is not shorn of all its romance. I am convinced of that from having to deal with a great number of intricate cases that arise between our men and the fair sex. The other day when some newspaper reporters were interviewing me they asked me about the slogan which is supposed to be ours but isn't, about always getting our man. I said, "That is not true; we get most of them, but what is true is that most of our men are got by the ladies." The newspapers rather twisted that and made it appear that we were rather egotistical, because they said we always got our women. [Laughter.]

As a matter of fact I did. I am very happy to say that I am married to a very beautiful, a very long-suffering and good-natured girl from your country, and often in joking with her I refer to your country as her "late country", and she fires up at once and says there's nothing late about it.

In a single year a member of our force might very well be riding horses in the West, he might then act as an observer in aircraft flying on either coast or on the Great Lakes, he might then go north and drive a dog team within the Arctic Circle, or he might be detailed to border work south of Montreal where he would have some of the most exciting experiences of his life chasing bootleggers or rum runners or dope peddlers, or he might be detailed to carry out a wild-fowl census. That is rather difficult. I don't know whether anyone here can tell us just how to do it, but that is one of the jobs of the Royal Canadian Mounted Police.

Speaking for the delegation, and in conclusion, we Canadians are very happy to be here. We appreciate immensely the invitation from the President which brought us here. Our forces take especial inter-

est in your President. We admire him greatly, and some of us know him personally for the reason that he has his summer home in Canada at Campobello Island, and when he goes there our force has the high honor of looking after his safety and welfare.

We shall benefit much, I know, by the most excellent speeches that we have heard. We shall watch with interest the solution of your difficulties in connection with the protection of wildlife. Your problem is more acute than ours. Our country is not so thickly populated and is wilder, more unsettled than yours, and therefore our problem is not so acute. I think perhaps that we started earlier to conserve our wildlife resources than you did, but we feel that we can learn much from you. I have admired tremendously the sincerity of purpose shown; it is of inestimable value, that sincerity, and I have been much struck by it in the speeches of your new president during the various meetings of the conference, and of your chairman, Mr. Silcox. They both have my greatest admiration and the admiration of our delegation for the masterful way that they have handled the difficult subjects and the difficult situations and the difficult people, sometimes, that they have had to deal with. [Applause.]

I feel certain that the conference will do much good with respect to the preservation of the wild fowl, and I am positive that it will do a great deal of good for international accord and for cooperation in every branch of our lives.

I was a little taken aback at the beginning of the banquet to find that my esteemed colleague from Mexico has a larger family than I. If wildlife has any recreational value, and the Secretary said it had, it appeals to both him and me very strongly. He has four girls and four boys, and I was much chagrined because I have only three of each. As we shook hands over it, he said, "We are both young men yet." [Laughter.]

A concluding word to the ladies of the banquet. I was in Boston and New York quite recently judging horses at various point-to-point races, hunter trials, and horse shows, and I found that all the ladies in those two cities—I think perhaps Washington is no exception—were deeply interested in the quintuplets. I would like to tell you that they are growing, they are thriving splendidly, and I hope that we shall retain the record, but I understand that you are after that record also. Thank you. [Laughter and applause.]

Chairman Silcox. From the popular applause of Sir James' last statement I wonder whether we have accepted Canada's challenge on the matter. [Laughter.]

We have with us tonight His Excellency the Ambassador of Mexico. I have asked him if he will say a few words to us, at least extend greetings. Unfortunately, by one of the printer's slips his name was not included on the program, and we have personally tendered to him our excuses, that those things happen in the general line-up of the mechanism of arranging details. He has very graciously accepted our statement and has come to the banquet and sat with us at the head table, and I would like to have him say a few words or extend greetings in such a manner as he desires to this meeting. His Excellency Señor Dr. Francisco Castillo Najera.

Remarks of His Excellency Señor Dr. Francisco Castillo Najera, Ambassador from Mexico

His Excellency Señor Dr. Francisco Castillo Najera. I have really nothing to say. I don't know very much of wildlife. Being a diplomat I don't know much about that, but Mr. Zinser, who is representing Mexico in this conference, is an expert on these matters, not only on wild animals, but as the delegate from Canada has mentioned, certain domestic animals. Instead of my taking your time, he is going to talk as an expert.

I want to thank you for the kindness you have extended to me in inviting me here. That is representative of the good will manifested not only by the Government and the different sections of this country but the good will and understanding of the Republic of Mexico. You are reciprocated. I think this is one of the many manifestations of good friendship that since a few years ago has been accorded between our two countries. I only hope that this friendship will be everlasting. [Applause.]

Chairman Silcox. We appreciate sincerely Your Excellency coming to the banquet, and I think that you are rather modest in stating the charm of your country. The desire now of most Americans since Florida has had a temperature change of 24° is finding their winter recreation in Mexico. Many of our writers have sung the charm of your country, its beauty, graciousness, and color. We are particularly glad to have had you come with us tonight and to make a few remarks on the matter of good will between both of our countries. We sincerely join with you that our relationships of good will and friendliness will be everlasting. [Applause.]

As His Excellency pointed out, Señor Juan Zinser, who is the Chief of the Game Service, Department of Forestry, Game, and Fish of the Republic of Mexico, whom we have had the honor to have on our program at the auditorium, will now address us. We left him entirely free field to express himself in any way he wants. [Applause.]

Address of Señor Juan Zinser

Señor Juan Zinser. Mr. Secretary, Your Excellency, Mr. Toastmaster, ladies and gentlemen. Years ago we began in Mexico the study of the conservation of wildlife, but the lack of necessary elements made it impossible to put this proposal into practice.

In the beginning of 1936, by decree of President General Lazaro Cardenas, who is a great friend of nature, the Department of Forestry, Game, and Fish was established, and now it is giving special attention to all nature resources.

The first point in the problem was the conservation of the forests. This had a great importance in the conservation of the soil, controlling the rain and erosion. Without woods wildlife cannot exist, animals have no refuge. The department has a wide problem in conservation, and especially reforestation of denuded areas. At the head of this department is Chief Miguel A. de Quevedo, who has dedicated his life to the trees, and after long years of work he has planted systems which will, in the future, prevent the destruction

of the woods. Chief Ingeniero is called in Mexico the "Apostle of Trees."

The second point is the rational organization of wildlife. Wildlife needs a special law. Men make laws for themselves in relation to human life; it is necessary to make a law for wildlife, by which they will be assured the right of life and existence, especially the wild animals. Their rational preservation must be controlled in such form that the different species never shall be in danger of disappearing. The mammals and birds useful to man must be propagated.

Animals which are used for food must be under special control. One of the principal points the department has in view is to avoid all game slaughter. In countries as big as Mexico, and with so many regions and with so scattered a population, it is very difficult and expensive to have the necessary vigilance, but we will have wardens at all principal points along the border and at all ports. At the entries to the cities there will be vigilance to see that all sport hunters have licenses and kill not more than they are permitted to kill.

In the markets and other places where game or its products are sold, there will be a special vigilance. There now exists a regulation permitting trade in deer and its products, the meat, skin, etc. By a decree in 1936 the selling of wild duck is absolutely prohibited. [Applause.] So they can be much better controlled.

In the future all regulations will be dictated to better the conditions of wildlife, and not only the department is doing its best, but also the governors of the different States are giving their help.

The formation of parks, game reservations, and special refuges for migratory birds is another point of the problem of the Department of Forestry, Game, and Fish.

Special attention is also given to fish by stocking rivers and lakes and strictly prohibiting all unlawful fishing.

I hope that this conference will be a great success and that the programs of the three nations will work together at all points and that wildlife may help us to be better friends. [Applause.]

Now, I want to express my most sincere gratitude to all who have been so kind, to all the American people who have been so hospitable and have permitted us to be with you on this occasion. I can assure you that the Mexican people will be with you, and I personally can assure you, too, that this will be one of the pleasantest remembrances of my life. [Applause.]

Chairman SILCOX. You will notice by looking at your program that Jay ("Ding") Darling, who is at the head table, was not included. We didn't anticipate having him at the head table with us. [Laughter.] We thought he might be left as a free agent on the floor to take out his rapiers and have a little fencing match with Secretary Wallace. "Ding" has put in a yeoman's job in trying to bring about what I would call fusing unity into all these diversified interests which have been represented here at the Wildlife Conference. "Ding" has given of himself emotionally, dynamically, and vitally in trying to see whether or not this particular effort of ours will bring about a quality of unity, so that from now on instead of handling this whole wildlife problem in little sectors, we will have a general offensive on the whole line.

I am happy that we have persuaded him, in spite of his long, exhausting duties today, to come with us at the head table, and am anxious to have him say a few words. "Ding" created in the general discussion a fantastic figure of his imagination, the bowlegged girl who wasn't invited to the dance, which was wildlife, using it figuratively. She has come to take "Ding" to task.

"The Bowlegged Girl"

The Bowlegged Girl (impersonated by a member of the New York delegation). Folks, for a great many years I have wanted to go to the party. I am Wildlife Conservation, the bowlegged girl. I waited a good many years for somebody to take me to the meeting, but I had to wait for my fairy prince, dear old Jay Darling, and he is a darling. But finally I found my fairy prince, and I have found my fairy godmother—I found her in the Wildlife Institute and in the General Federation for Wildlife Conservation.

[Removing his wig.] As one of the very small lights in conservation in New York, so small, in fact, that I fitted this particular role, I simply want to say that we, like every other State in the Union, are back of Jay Darling 100 percent and this tremendous national effort to really do something for our wildlife. [Applause.]

Chairman Silcox. Ding, this is sort of taking a mean advantage of you. Since you created this fictitious figure out of your own imagination, we thought we ought to materialize it in some form.

I wonder, even if you have talked quite a bit today, if you won't say a few words. You are the acting president. [Applause.]

Remarks of Mr. Jay N. Darling

Mr. Jay N. Darling. I really should be dignified as the new president of this institution. I should address our neighboring guests with dignity, but the Secretary of Agriculture started a debate with me on the economic justification of wildlife and I think I am entitled to a comeback. I always knew that he never read all my memoranda that I sent to him. [Laughter.] The only time they ever looked at them was when I drew a picture on them. The next law I am going to advocate is one that all heads of departments of the United States Government listen to each other's broadcasts and read each other's memoranda, and then they will know more about what they are trying to do. I think it ought to be compulsory, then we would need no new department of conservation.

I really have shot all my firecrackers and I am not going to try any more. I thank you all, of course, for your very generous appreciation of what I have tried to do. It is no more than some of you would have done if you had had the same opportunity. I want to tell you that the job is not only started, but it is well on the way. The next job is to complete it and carry on this thing. Don't think just because we have had a pleasant meeting and national unity and international cooperation that we have even begun to restore the wildlife population in its required extent.

I thank you all, and goodnight. [Applause.]

Chairman Silcox. That is the shortest speech I have heard "Ding" Darling make.

We have another distinguished guest at the table with us, Mr. Harkin, who is the Commissioner of Parks of Canada. Mr. Harkin, will you say a few words to us? [Applause.]

REMARKS OF HON. J. B. HARKIN, CANADIAN COMMISSIONER OF PARKS

Mr. J. B. HARKIN. Mr. Chairman and gentlemen, as you all no doubt have observed, this is entirely unexpected. I perhaps feel I should have a spite against the Chair for calling upon me. I had thought that when I had arranged that Gen. Sir James MacBrien should speak to you, that would be sufficient to represent Canada.

My duty down here has been somewhat peculiar. I had very specific instructions from our State Department as to my duties, which were to see that we observed all the niceties and the proprieties in regard to international relations. That perhaps is why I requested Sir James MacBrien to speak to you as representing Canada.

I notice that without consultation with me the conference this afternoon imposed a duty upon me, that of being one of the members of an international committee to deal with the international aspects of wildlife. I want to assure you that so far as Canada is concerned we shall continue to deal with wildlife matters as we have in the past; that is, to maintain the most amicable and friendly relationships with the countries concerned. [Applause.]

I want further to pay a tribute to your Biological Survey. Since the inception of the Migratory Bird Treaty it has been one of my duties to deal with that service in connection with the protection of the migratory-bird law. I want to say that from the outset and continuously we have had the most perfect cooperation from your service; there have never been any misunderstandings; we have got on very well together. We have had difficulties to face; there have been matters that perhaps from your viewpoint appeared not just quite right in relationship to matters in Canada; there have been matters, I may add, that from our viewpoint weren't just quite in line with proper conservation principles in the United States, but we have always got together, we have ironed them out, we have never fought, and I want to assure you that, so far as Canada is concerned, I know that in the future, as in the past, there will be absolute cooperation. I haven't any doubt that having had many discussions since I arrived in Washington on Sunday with the representative of Mexico, that also will be true with respect to Mexico.

I foresee that through the operation of your confederation, through the operation of a confederation that we hope to establish in Canada, through the operation of this international committee, we shall all be able to contribute a great deal to the welfare of wildlife in the North American Continent.

I think that while in some respects we have waited too long, it is not yet too late to make a real effort and to make a real success of our efforts. I know that that effort, however, will depend upon the cooperation which you all give.

During the past 3 or 4 days there have been many rumors. We as an outside body have only heard rumors, of course. There have been differences of opinion, but, after all, it was a very gratifying

thing to me this afternoon to see that they had all been ironed out and that we can all look forward to a real restoration of wildlife in the North American Continent. [Applause.]

Chairman SILCOX. As has been pointed out in a number of talks made here this evening, one thing stands out as particularly significant, and that is the comity of relationships both to the north and south with our good neighbors. It is a much finer thing that we sit down around the table discussing wildlife, discussing scientific adventures into the field of the unknown, than it is that we get into the high tensions that Europe now finds itself in, and interchanges of this sort lay the foundation for a quality of friendliness and understanding that, as I say, is peculiarly significant while we are moved by a common purpose in which we have a common interest.

There is another feature to the program this evening that I know you will all be interested in. Dr. Allen has used the movie device not only to take pictures of birds but to photograph sound. The modern field of photography, telephoto lenses, sound-recording devices, have given us an opportunity to record in rather permanent fashion not only the pictures of birds and animals in their native habitats but also the sounds they make, those of joy, the varying notes of the mocking bird, and other sounds of our feathered tribe as well as of our animals.

Dr. Allen has been a pioneer in the exploration of this field, and I know that you will be particularly interested in seeing the pictures and in listening to the reproduced sounds and songs of birds which Dr. Allen will present to you now in the form of a reel of film, and he will explain it as he goes along.

ADDRESS OF DR. ARTHUR A. ALLEN AS HE EXHIBITS HIS MOVIE AND SOUND PICTURES OF BIRDS

Dr. ARTHUR A. ALLEN (Department of Ornithology, Cornell University). I had hoped to have a few minutes to explain this film before it started, but since it is already on the screen I can merely call attention to our method of recording the voices of birds as here depicted and make the explanations later. Our sound equipment, being rather heavy, has to be carried in this truck. In addition to a microphone we have this large parabolic reflector. The microphone being held at the focal point of the reflector, it can then be aimed at the bird and one is enabled to shut out some of the extraneous sounds. The amplification has to be adjusted correctly, as here shown, before the song can be recorded accurately.

In these films you will sometimes see the bird singing, but more often you will hear its song while you see it doing something else. The sounds are not recorded synchronously with the picture in the majority of cases. You will notice occasionally extraneous sounds; such as the redwing blackbird which just sang while we were recording the kingfisher.

The next scene was taken in central New York during the migration of the Canada geese, and you now hear and see a flock of these wary old birds descending into a field near Aurora.

And now we come to a pair of marsh hawks attacking an owl, screeching as they dive at it and strike it with their talons, attempting to drive it out of their territory. It happens to be a stuffed owl

but they do not know the difference and at last they carry off its head in triumph.

We pass on to Taughannock, the highest falls east of the Rockies, where the peregrine falcon has nested for at least 25 years. The aerie is about 300 feet from the brink. Unfortunately, the falling water makes a good deal of noise, but the voice of the peregrine sounds above the rush of the water. The young on the nesting ledge now scold because dinner is late. But here comes mother with food for all—and how they seem to enjoy it!

It is our belief that if we can make wildlife interesting to 50 million people who are not represented here, that they will support any program of wildlife conservation that we wish to put forward. It is unfortunate that they don't see wildlife as we see it.

You may have difficulty hearing the twittering of the little hummingbird in this film. The young are fed in the unique way of having their breakfast injected through the tubular tongue of the mother. We found that this little bird was very appreciative of sugar water which we exposed for her in an artificial flower, and when the young ones were ready to leave the nest we perched them very conveniently near this flower. The mother bird was so enthusiastic over it that she started her nest for a second brood even before the young were out of the nest.

The little hummingbirds soon became accustomed to all of us and even to the children when they remained quiet and tried not even to smile—as you see here.

The loud calls which you now hear constitute the love song of the pied-billed grebe. This bird builds a floating nest at the edge of the cattails. For a long time it was thought that it did not sit on its eggs as other birds do but merely buried them in a pile of debris and let the heat of the sun hatch them out. The idea was unfounded, and we soon learned that she comes back and sits on her eggs like any other bird, as you now see, but when she hears anyone coming she very deftly covers her eggs and dives out of sight. Fortunately for us the little grebes are starting to hatch and you can see the mother bird breaking up the eggshell so it will sink and not attract attention to the nest.

The young grebes don't look much like their parents, being striped black and white. They are rather clumsy on land for their feet are far back by their tails. They are said to wear striped pajamas and sleep in the upper berth (climbing onto the mother's back).

This past spring we went on an expedition from Florida to Montana to record the voices of those rare birds that are almost extinct. We were able to do this because of the interest of Mr. A. R. Brand, the pioneer in bird-song recording, with Cornell University and the American Museum cooperating.

Here you see us near the home of Herbert Stoddard at Thomasville, Ga., concealing our sound truck near a clearing on the Colonel Thompson plantation where he has promised to have wild turkeys come at daybreak. We shall see whether he is true to his promise to call up the birds.

First come the bobwhites. You will hear in addition to the bobwhite song the rally or scatter call, and the challenge. Here is Stoddard himself calling turkeys. How successful he was you can now see: First a flock of hens; you can hardly tell which is Stoddard's

call and which is the hen turkey's. Soon you hear a couple of fine old gobblers coming. These are the genuine Florida wild turkeys, and I am sure they have never been contaminated by any domestic blood. There are flocks of mourning doves in the background.

From Thomasville we are going to take you down to the Wakulla River so that you can hear the limpkin or crying bird. The Wakulla River is a beautiful stream coming out of a spring 185 feet deep.

The sound you now hear is not someone having a tooth pulled; it is the bird itself, the limpkin. Listen! You might almost think that an alligator had hold of the leg of some luckless black brother.

We are going to jump now from Florida clear over to western Oklahoma on the Davidson ranch to give you a view of the lesser prairie chickens which are still holding their own on this ranch. This was in the days of the dust storms. During the 8 days we were there, there was only 1 day that the wind didn't blow and the dust obliterate the landscape. We put up a green blind. The cattle had never seen anything so green before and they all came lumbering in to get a good breakfast. It hadn't rained for 3 years.

Here is a little burrowing owl giving his curious call as he brings a lizard back to his mate down inside the burrow. He has to keep his eyes on the sky for fear he might be mistaken for a prairie dog by some of the hawks that are sailing overhead. One comes a little closer, and he decides it is time to get down in the burrow.

Now for the lesser prairie chickens. The males come together in groups of from 4 to 40, 6 weeks before the females arrive, and proceed to defend their little territories against aggression by their neighbors until their rights are finally respected so when the females do come there will be no grand rush. Now you are watching the way they learn to respect each other's rights. They come in before daylight and behave in this manner until about 8 o'clock in the morning. The idea is to catch your neighbor by the nape of his neck and throw him over on his back. Each little territory is about 25 feet square, and after 6 weeks of this fighting they learn to respect each other's rights. We are greatly assisted here by Mr. Verne Davidson, on whose ranch these prairie chickens are still holding their own because they have been protected. He has been making a study of these birds during the last 5 years.

We are going to pass on now to Colorado to give you a glimpse of the home life of the golden eagle. We are coming in near Denver with our two trucks, one the sound truck with recording instruments and the other our camping equipment and cameras. We covered about 15,000 miles on this trip, and I am glad to be able to report that we were successful in recording the voices of practically all the birds that we set out to find, including many of those which are birds nearing extinction, like the ivory-billed woodpecker, the lesser prairie chicken, the trumpeter swan, and so forth. We recorded something over 125 species of birds.

Now we see a golden eagle sailing overhead. We have come to the edge of Box Elder Canyon where we can look straight down for 750 feet. Here is the nesting ledge and the little eaglets—about a month old. The first old bird to come back has an evergreen branch to decorate the nest. They have already stored up plenty of food. The little fellows are not hungry and not greatly excited by the arrival of this parent. Now comes the female, the

larger bird, and drops another rabbit so they have nothing to worry about. The young are now at the stage where they can feed themselves.

I might say, in passing, that the golden eagle is one of our wariest birds. We hung the microphone over the edge of the cliff, down near to the nest where we could get the sound of the voices of the old and young. The little fellow in this picture doesn't seem to like it very well.

At this point I am going to show you how we are planning to use some of this material which we have been securing. A few years ago I stood in the halls of the American Museum examining one of their habitat groups. They had recently installed a group of English bird life and as I looked at it and saw the skylark in the air and the nightingale on the low branch of a tree, I realized it was a magnificent production of the taxidermist's art. It gave me a splendid conception of what those birds are like, but I couldn't help wishing that the skylark's wings would move and that I might hear the song coming from his throat, and the same of the nightingale and the other birds. I wanted that habitat group to come to life. We are now planning to make this possible.

You are now looking at one of the habitat groups which we propose to set up at Cornell University, and which we can bring to life so that the old grouse in the background will actually begin to drum; so that you can see and hear him drum; so that that flock of geese in the sky will come overhead and honk as you are accustomed to hear them; so that the little song sparrow in the pussy willows will sing; and the grouse in full display will go ahead and give you the real impression of the living, courting bird.

As I have already said, what we hope to do is for the benefit of those millions who do not already have the interest in wildlife that we have; to make our museum so interesting and so real that they cannot help feeling and realizing as we do that wildlife must be conserved, even though they haven't enjoyed the same experiences out of doors that we have.

This evening in a somewhat imperfect fashion I want to bring this habitat group to life. I want you to hear the grouse drum; I want you to see that flicker behind him build his nest and the pileated woodpecker in the beech give his call; even the barred owl in the hollow tree I want to come to life and hoot at you.

That same day when I was in the American Museum looking over their habitat groups I walked along the hall and saw there a specimen of the great auk. I saw a little group of the passenger pigeons and another of the heath hen; birds that now have gone forever, that never can live for us, and I thought how much worth while it would be if we could at this time, before it is too late, save the voices and the actions of those other birds which are on the verge of extinction. So on this expedition which Mr. Brand made possible this spring we spent considerable time hunting for the ivory-billed woodpecker. We were finally successful in finding the bird. I can't tell you about that tonight, but I want to show you what we propose to do with the pictures of the ivory-bills which we were able to get and the sound records of the bird's voice, so that this bird, which I don't suppose anyone here has seen alive, may live for you as it lived for us.

Here on the screen we have a proposed habitat group, a pair of ivory-billed woodpeckers at their nest. In the background is a pileated woodpecker—so that you may see the difference between the two. Now we will bring the two groups to life. In the first habitat group I want you to listen to the grouse drumming, and then if you can watch it drum and see how the sound is produced I shall be very happy. If you will now concentrate on that ruffed grouse in the background you will hear and see him drum. He does not pound on the log; his wings do not hit his breast; they do not hit behind his back; the sound is produced entirely by the concussion of the air. Those of us who look for this in the woods see a lot more than we see over the gun barrel.

We are now listening to the song sparrow. He is over at the right in the pussy willows. It isn't the grouse alone that makes the woods attractive, its is everything that goes with it. There is a pair of brown thrashers. You have seen how we recorded their voice. Now we will see them come to life; and next the little white-throated sparrow in the foreground scratching in the leaves sings his "Pure sweet Canada! Canada! Canada!" Up behind the strutting grouse you can see a flicker against the side of a tree and hear him calling. We get a little closer to him and stop to watch him building his nest and throwing out the chips. High up in the beech tree you see the pileated woodpecker and now you watch him and hear him call before he enters his next hole.

Perhaps we are ready to have that old drummer on the log start displaying for his mate. You think at first the sound is that of a freight train getting under way but it is really the sound he makes during his courtship. While he continues to call, the female steps onto her nest. She is a little bit afraid of him. Who wouldn't be of a sound like that? There is still a flock of geese in the sky and a barred owl in the hollow tree at the left to talk to you. All of these things, and many more, I know you see when you go out in the woods to hunt grouse; they are all a part of it. We would like it to be as real to others as it is to those of us who find the time and have the inclination to search out nature's secrets.

Next you see our woodpecker group. First we listen to the pileated woodpecker, that chap up in the background, and then to the ivorybill, and discover how different their notes really are. The ivorybill is perhaps the rarest of all American birds, about the size of a crow, with a brilliant scarlet crest; that of the female being black. They are now changing places on the nest. They changed at about 2-hour intervals. The female always saw to it that she took the last shift in the afternoon so that the male would be on the eggs all night. There he remained until 6 o'clock the following morning and she always knew where he spent the night.

I am sorry there isn't time to show you more. [Applause.]

Chairman SILCOX. We are happy to have had you all here. We have enjoyed it very much.

Mr. SKELLY. Mr. Chairman, we have with us tonight two or three men who have been very active and I would like them to stand and be shown: Senator Walcott, Senator Nye, John Burnham, Senator Hawes, of Missouri. We all appreciate what they have done. [Applause.]

Chairman SILCOX. I wish the members who have been named would stand, if they are here, so the audience may see them. I wish there were time to call on the large number of people who have been vitally interested in the development of game restoration and conservation in this country. By the limitation of time we cannot call upon them. I hesitate to call the names of those who have been interested for fear it might take the entire rest of the evening. There are a great many here and I should hate to overlook anyone. A large group of men are here who have taken an active part in game conservation for many years, and may I extend my appreciation to them and express my regrets that we have not been able to call on all those individually who have made real contributions in the field of conservation.

With that I close the evening and again express my appreciation for your attending the banquet.

(The meeting adjourned at 11:20 p. m.)

THURSDAY MORNING SESSION, FEBRUARY 6, 1936

The meeting was called to order at 9:55 a. m. by Mr. Seth Gordon.

Mr. GORDON. As you have probably noticed on the program as we have gone along for these general sessions, at each session there has been a different person in charge of the program. The chairman this morning, for those of you who have not had an opportunity to know him, is Mr. Gabrielson, the new Chief of the Biological Survey, who has succeeded that dynamic personality you have heard so much of during the last few days. I am sure as you get to know Ira Gabrielson better you will all agree that he was a mighty good selection for that important job.

It is now my pleasure to present to you Ira N. Gabrielson, the Chief of the United States Biological Survey, who will be the chairman of the session this morning. [Applause.]

(Mr. Ira N. Gabrielson took the chair.)

REMARKS OF IRA N. GABRIELSON

Chairman GABRIELSON. Members of the conference, I can't say how delighted I am at the results of this conference. I hope some of you will stay through the day. You may all run out when I start to make my speech tomorrow, but there are a lot of other good speakers coming on ahead of me, and I hope you will stay and hear what they have to say.

It is my great pleasure to be able to introduce to you the Secretary of the Interior, the Honorable Harold L. Ickes. I have had the privilege of attending several conferences with him and Mr. Darling, and I can assure you that he is a genuine conservationist. Mr. Ickes. [Applause.]

ADDRESS OF HON. HAROLD ICKES

Hon. HAROLD L. ICKES. Mr. Chairman, ladies, and gentlemen: I am here, if for no other reason, to attest my interest in and pledge my cooperation with this wildlife movement. [Applause.]

Conservation is to me the most interesting, the most vital, the most important function from a long-range point of view of any

governmental activity. I would rather make some such contribution as that made by my friend, Gifford Pinchot, whom I see here looming up in the distance, than those of most other public officials who have been in and out of Washington. It would be a wonderful thing to go down in history as the man who started the conservation movement, as the man who made the people realize what their natural resources, both animate and inanimate, meant to the country.

In the Department of the Interior we bear a very grave responsibility with respect to conservation matters generally, and, so far as the national parks are concerned, we carry a good deal of responsibility with respect to wildlife. It would not be inappropriate on this occasion to tell you just how the wildlife movement fits in with our national parks.

I suppose it might be fair to say that the national parks system constitutes a real sanctuary for the game, the birds and the fish of America. Hunting is prohibited within their boundaries. Fishing is permitted under strict regulation. We are the real conservationists in the sense that we protect wildlife. We not only protect it, we foster it with care and give it every opportunity to increase.

How many American sportsmen realize the debt they owe to the protection that the national parks afford wildlife?

Take Yellowstone Park as an example. We inaugurated a program there to protect the elk. The program has been so successful that these animals now number close to 30,000. These elk now leave the boundaries of Yellowstone Park and roam onto the legitimate ranges of the sportsmen. We take excess elk from Yellowstone to restock depleted forests in other sections of the country, so that sportsmen may not be denied an opportunity to hunt that excess. This policy has been followed particularly in all the Southwestern States. The elk that you hunt there very likely are descendants of the herd that we are protecting and have been protecting for many years in Yellowstone Park.

Sometimes people crave permission to hunt in the parks. Imagine what the result would be! It would not be long before the game in the parks was depleted to such an extent that we would have to declare open and closed seasons and would no longer have any excess to overflow the parks or to be transported to other parts of the country.

We might work out the same plan with our buffalo herd in Yellowstone Park, except that it is impractical because the buffalo requires such a wide territory within which to range. However, we could restock buffalo for hunting purposes in large sections of the United States if we had the necessary range.

Or take the question of fish. We collected from the waters of Yellowstone Park this year almost 60,000,000 eggs from three species of trout. We incubated these eggs in cooperation with the Bureau of Fisheries and with some of the States, particularly Montana, and with the fry it was possible to restock a great many of the streams that have been fished out by overzealous fishermen.

With the excess fish that are produced from the eggs that we harvest in Yellowstone, and the 3,000 elk a year which can be hunted outside Yellowstone we are making a very real contribution toward conservation of our wildlife, and it is the conservation of it that I am particularly interested in. The sportsmen of America ought to

support at all costs this policy of the national parks. It is better for them in the long run thta we should forbid hunting in the parks.

Our parks are sanctuaries, not only for game and fish, but sanctuaries for trees. We don't allow our forests to be lumbered. We retain the natural conditions just so far as possible. We have two main objectives: Preservation of scenery and the natural surroundings, and preservation of game life.

Occasionally when we ask for an addition to one of our national parks, sportsmen object because they see in the annexation more territory closed to hunting. That is a short-sighted policy. If your theory is to go out and shoot all the game you can while you can, then we ought not to have national parks. If you are conservationists as well as sportsmen you ought to insist that sanctuaries in the form of national parks and monuments be maintained for wildlife preservation, and should be absolutely closed especially to the hunter, and under regulation to the fisherman. I won't insist that these be in the National Parks system since I know that Mr. Gabrielson is following Mr. Darling's policy in establishing such sanctuaries in his department.

Mr. Darling or some other speaker before one of these meetings, according to the voracious newspapers, urged the other day that all conservationists present a united front.

That made me little reminiscent. I turned to a copy of a speech that I made at the banquet of the American Game Conference in New York on January 22, 1935. It might not be out of place for me to read a few paragraphs of what I said on that occasion, because I think it is as true now as it was then.

> The real trouble with the conservation movement in this country is that it is divided into small cliques and factions; it is not a cohesive, coherent movement. Forces that ought to be united and working disinterestedly for the common good are so busy struggling for their own selfish interests that due to the resulting confusion of counsel the exploiters are still largely having their wanton way with the natural resources of America.
>
> It is high time for all of us who pay more than lip service to conservation to unite in the common cause, realizing that conservation is a single objective and not a congeries of policies. There never has been a more opportune time for a great advance all along the line for those objectives conservationists believe in. We have in the White House today a President who is a practical as well as a theoretical conservationist. His stand is far in advance of any of his predecessors. What other President in our history has done so much to reclaim our forests, to reclaim submarginal lands, to harness our floods and purify our streams, to call a halt to the sinful waste of our oil resources? In his conservation program he ought to have the enthusiastic assistance of every true conservationist. He can be trusted to organize and realign Government machinery in such a fashion as to achieve the best results for conservation. His instincts are right, his judgment is sound, and he has a farther-reaching vision that any man in the United States today.

Yet the fact is that so far from being accorded the sympathetic and understanding cooperation that he is entitled to by conservationists everywhere, President Roosevelt is actually being obstructed and harassed in working out his policies. Little cliques or one-track-minded conservationists concerned only with their own selfish ends have embarked on a campaign of propaganda, the clear object of which is to deny to the great conservationist in Washington the right to form and carry out his own judgments for the best good of the country as a whole. Some of these groups may be small but they are well-organized. As a matter of fact some of them are mere

paper organizations that exist on propaganda for propaganda. I counsel them to declare a truce, to cease their maneuvers for selfish purposes. Little as they seem to realize, the President is in a better position than are they to decide a national policy in a national interest. A babble of conflicting advice will only make for disunion among the ranks of the conservationists, will only play into the hands of the despoilers of our rich heritage. I believe that if with the support of the real conservationists of the country President Roosevelt succeeds in developing and implementing a sound, comprehensive national policy of conservation, at the end of his service to the country as President he will have made a greater advance all along the line than we have witnessed in this country since the word conservation was first understood to have any meaning for America. Not only this but the principle of conservation will have been established so firmly as one of the rocks of the foundation of our social and economic structure, that no national administration in the future would dare to do otherwise than to go forward with that policy.

That is what I said over a year ago. That is what I believe today. I think that there ought to be a great movement toward the union into one cohesive, aggressive organization, of all those in this country who are interested in conservation.

The United States has its full quota of despoilers of the land who are interested solely in making a selfish profit out of the destruction of natural resources. If we are to make a common cause against them, it is absolutely necessary for conservationists of America of all shades of opinion to present a united front and to abandon the factional strife that has weakened our ranks in the past.

Isn't it reasonable to suggest that in the formulation of any national policy on conservation, those who are directly charged with responsibility for conservation, for carrying out whatever policies may find expression in legislation in Washington, should be consulted? Isn't it reasonable that the President of the United States, who in the end will be chiefly charged with the enactment of the conservation policy, should be consulted?

In getting together, in considering policies, it is well to have our feet on the ground, to take into account people other than those who are actually in conference who have an interest in this subject and should be consulted. I wish that we could see a fighting, aggressive conservation movement. I want to see more Gifford Pinchots and more Ding Darlings take their coats off, push up their sleeves, and get into this fight, but I don't want to see disunion, misunderstanding, backfiring, or anything of that sort. I am willing to join with other real conservationists. I believe I am a real conservationist; I am, if having the faith that I have had for twenty-five years makes me one.

Since I have been Secretary of the Interior I have never overlooked any opportunity to cooperate with any other division of the Government interested in the preservation of wildlife or in conservation in any of its aspects.

I remember one conference in my office attended by Mr. Darling and Mr. Gabrielson. There had been complaints about the destruction of the habitats of wildlife as a result of the activities of our Reclamation Service. Ding Darling wrote an article about it before

the conference. When we analyzed it, and got down to cases, we found that most of the criticism related to activities of the Bureau of Reclamation before this administration. As a result of our conference—I think Mr. Darling left perfectly satisfied that not only the head of the Department but the Chief of the Bureau of Reclamation were willing to cooperate with him. Of course, we have to have reclamation projects, but I don't see why we can't have a reclamation project which will serve an area properly and at the same time take into consideration the needs of wildlife, making adequate provision for its protection, preservation, and continuation. [Applause.]

When I entered the hall this morning I saw a cartoon, representing an unbalanced scale. On one side were a few specimens of wildlife that looked as if they hadn't had a square meal for a long time, and weighing them down were a number of figures labeled "Drainage", "Wasteful lumbering", "Over-hunting", "Over-grazing", "Pollution", "Roads", "Drought", and "Politics."

Now with respect to our own sanctuaries for wildlife, I was able to feel the glow of a holier-than-thou feeling. We have no drainage in the national parks and monuments.

We have no wasteful lumbering; we don't have any lumbering. We have no over-hunting because, except when we have to keep down predatory animals, we do not permit hunting. We don't have any over-grazing because we don't allow our parks and national monuments to be grazed. We resisted that even during the World War when the sheepmen of the West in order to save the world for democracy wanted to turn their flocks in on our national parks. We have no stream pollution; we keep our streams pure. The fewer roads we have in the national parks and monuments the better it suits the present Secretary of the Interior. [Applause.] I am heretical; I may be speaking out of turn, but I don't think we believe much in skyline drives. The roads in the parks that were there when I took office I have to accept, but I am resisting the movement for the construction of connecting roads through the surrounding national forests or over the public domain or over the private lands in order to get more people into the parks. I don't want to see our national parks become Coney Islands. [Applause.]

As to droughts the natural conditions have not been disturbed. The soil coverage is there, the forests are there, and fortunately in most of our national parks the sources of our streams are up in the high mountains and glaciers where we get water when there is water.

As to politics, well, politics we have always with us, but I think it is a well-established policy not only of the executive branch of the Government but the legislative as well that the national parks and monuments are to be sanctuaries for all time to come for the people, and in order to give the people the real advantage that they are entitled to from these national parks and monuments we must preserve them in their primitive condition just so far as possible. That means growing trees, that means forage, that means animal life, that means fish life.

I warned you at the outset that I hadn't made any prepared address. I am proving it now. I am going to thank you for the privilege that I have had of announcing in a halting and imperfect fashion the policy of the various bureaus within the Department of

B4711M

A, Woodcock on nest near Asheville, N. C. (Biological Survey photo.)

B3742M

B, Nest of woodcock eggs. (Biological Survey photo.)

B5584M

A, Sage grouse resting on the ground. (Biological Survey photo.)

B36925

B, Nest and eggs of sage grouse. (Biological Survey photo.)

the Interior with respect to matters in which you are so very much interested. Thank you. [Applause.]

Chairman GABRIELSON. We very much appreciate having Secretary Ickes with us this morning.

Day before yesterday we had on the program a man who was not able to be here, who is another real "wildest lifer" that I know, the Honorable Richard M. Kleberg, Congressman from Texas. When he isn't in Congress he and his associates run a little farm down in Texas. I was privileged to look at some of it this last fall. The farm isn't very big, but I saw more wild turkeys on it than I have ever seen in all my life put together, and a great deal of other wildlife was there.

This little farm that he is interested in, I think, has something over a million acres, and it is one of the finest natural wildlife preserves that it has ever been my privilege to see.

I am going to introduce for just a few moments—he still has a cold and doesn't want to talk very long—Dick Kleberg. [Applause.]

ADDRESS OF HON. RICHARD M. KLEBERG

Hon. RICHARD M. KLEBERG. Mr. Chairman, members of the audience, may I at the outset call attention to the fact that in addition to a cold I have never yet in the 4 years I have been in the House of Representatives exceeded the 5-minute rule. You may feel perfectly easy.

I sat through yesterday and heard discussions from this microphone that made me more hopeful in reference to the future of our country than I have ever been before.

If we go back far enough to the beginning of this country and follow its history with care up to the present date, we find inseparably connected with its progress a lesson which we are just beginning to heed.

It has been said before that the road to progress is paved with mistakes that have been corrected. It is always better to try to correct mistakes when we are really conscious of them rather than to attempt to rectify an enormous blunder, which leads inevitably to disaster, in too big a hurry.

This conference, preliminary to an organized attack on the correction of the natural wildlife resource problem which confronts this country, prompts me to ask all of you here to look back in your own minds through history right up to the present date and draw your own conclusions. We have no definite idea other than those facts which are immediately established with reference to the length of time the American Indian had these United States. We can look back in history and recognize conditions in our neighbor Republic of Mexico, populated generally by descendants of Indian races. We find, at least, I do, in the lessons which inevitably come if we look for facts in history—and we must do that if we are to progress in any degree—that when the Pilgrim forefathers landed here, and during the time they pushed the boundaries of the territorial United States back to the Gulf of Mexico, the Pacific, the Canadian line, and down the eastern shore, this was a veritable paradise of game and wildlife generally. We found ourselves, by States and commu-

nities, finally forced to pass certain restrictive laws prohibiting men from taking more than a certain number of the various varieties; these were known as game laws, bag limits, and so forth.

Did it ever occur to you that during the centuries that the red man occupied the territorial country which is now our United States there were no game laws? Did it ever occur to you, by comparison, even in Mexico, where we have no market limit on the bag or the take and are just beginning to take cognizance of the ravages of modern civilization in passing certain laws, that they had no bag limit, and still, with many of the varieties of game which hunters love in this country, they have more there with no game laws than we have here, even during the years we have had game laws in various States and in the Nation?

That thought brings the definite conviction to my mind that somewhere, somehow, an all-wise Providence planted an instinctive regard for the natural wildlife resource in the mind of the savage Indian which the civilized man of today must learn and which he needs for essential progress, because, after all, those of us who live today and who analyze our position here on this Mother Earth recognize that what we do today in every form has a direct bearing on the future. Those who have no interest in posterity or in our country's future are not to be found in this audience, so I take the liberty here and now of paying a tribute to this great group of my fellow Americans who have shown the first active interest in the fundamental and basic problem which the rapid advance of science and the hurry of modern-day civilization has brought and laid on our doorstep.

The American farmer and ranchman, the American doctor, butcher, baker, and candlestick maker, are all affected, with an interest in the problem which you are here to attack in a nonpartisan, unselfish way, looking definitely to the future of our country which we love and those who follow us.

Mr. Chairman, it is indeed a privilege to me to meet with you here this morning, and I am here to pledge my best efforts as long as I am privileged to represent a great district in the Congress of the United States, to do what I can in my humble way to help you out. [Applause.]

Chairman GABRIELSON. The next speaker on our program is Dr. John W. Studebaker, United States Commissioner of Education. We are fortunate, I think, in having a greater and wider interest in wildlife in the city of Washington now than we have ever had before, at least, as far as my knowledge goes, and there are many people concerned with wildlife who a few years ago were not at all conscious of the fact that we had the kind of wildlife that we are interested in.

I think Dr. Studebaker has been interested a long time, and I know that he has something interesting to tell you. Dr. John W. Studebaker. [Applause.]

REMARKS OF DR. JOHN W. STUDEBAKER

Dr. JOHN W. STUDEBAKER. Mr. Chairman, ladies, and gentlemen, I am always happy to participate in any affair with which my fellow townsman, Jay Darling, has something to do.

I am not a specialist in wildlife or in conservation, but I do want to give to you, at Mr. Darling's request, some rather brief and definite suggestions about the part which organized education may play in the conservation of wildlife and other national resources.

First, I shall read a statement and then make a few brief comments.

The Federal Government is now vitally concerned with the need of arousing the interest and securing the participation of citizens in a Nation-wide plan for conservation of national resources. Disastrous results of neglect are now so apparent that the time is appropriate for a widespread attack on this vital problem. This approach needs to be national in scope, since many of these resources are, indeed, national in their contacts and are not limited by local or State boundaries.

The schools of the country, with their enrollments of tens of millions of learners, should become the most important ally of the agencies primarily interested in the conservation of our national resources. The most effective method of disseminating information about conservation and of building a public support, on the basis of fact, for plans to recreate and conserve our abundance, is to utilize this gigantic agency for the systematic transmission of ideas called organized education. It is trite but still true to say that "As the school is, so is the Nation."

To be effective in educating the Nation concerning conservation the information disseminated must meet three requirements: First it must have genuine scientific authenticity. Second, it must be organized for school use by professionally trained and experienced curriculum specialists in conformity with State and local curriculum offerings. And third, it must find its way to the pupils through the regular channels provided by the Federal, State, and local educational agencies.

The schools are already giving some but only relatively slight attention to conservation in connection with courses in various sciences and social studies at elementary school, high school, and college levels. The work needs to be greatly expanded, vitalized, and integrated to the end that pupils in the schools may approach adult citizenship with a much clearer realization than now obtains not only of their responsibility but of the real opportunity which exists for them in conserving wildlife, forests, land and soil, oil and minerals, and the even more important fields of health and human life.

In order (1) to assist the Federal Government in arousing interest in and disseminating information about conservation, (2) to assist school officials in formulating curriculum material, and (3) to organize and disseminate material suitable for school use, an educational service in the Conservation of National Resources should be set up in the United States Office of Education. Apart from the work done in that office in connection with the teaching of vocational agriculture, there is no provision for the stimulation of educational activity in conservation among the great rank and file of pupils in the schools of America.

It is estimated that in order to render such service the staff of the Office of Education will need to be expanded by the addition of some specialists for full-time and by the employment of other

professional help which can be called in from time to time for special assignments. With research, clerical and stenographic assistance, and contingent expenses, the total cost of launching and maintaining such a service will be approximately $35,000 a year.

Through study, experimentation, dissemination of information, and professional counsel, the Office of Education can do much to help the schools in developing effective programs of instruction in conservation, provided, of course, that a staff and the necessary financial help are made available.

The following suggestions are illustrative of a few types of services which can be developed by the Office of Education. It is believed that such a program will not only give great impetus to the teaching of conservation in the schools, but will show what can best be included in such a program of instruction in this field and how its objectives can be most effectively achieved.

1. Establish cooperation between governmental and other technicians in various fields of conservation and experienced educators with a view to preparing usable teaching materials on conservation. There is on the one hand a great need for reliable and interestingly presented facts on the various types of conservation; on the other hand, there is a need for inducing proper agencies to arrange these facts in textbooks, teaching units, courses of study, and supplementary materials graduated on the basis of interest and difficulty. The preparation of such materials should utilize motion pictures and other forms of graphic representation as well as textual matter.

2. Stimulate cooperation between school administrators and teachers in the study of how and why problems of the conservation of natural resources should be given adequate attention in the schools. The Office of Education has for many years enjoyed the confidence of State, county, and local school officers. Cooperatively problems of the type involved in conservation education can be attacked and solved. The Office of Education not only can stimulate studies of the curriculum and teaching problems in this field but it can disseminate the findings of such studies through published reports, through counseling with school authorities and by other means. An example of a curriculum problem in conservation education, which needs very much to be studied is whether this type of instruction can best be given through separate courses or whether its objectives can be more effectively accomplished through integrating conservation instruction with certain parts of the existing school program. Conservation education specialists in the Office of Education could assist school authorities not only in developing new materials and methods of instruction in the field of conservation but could help them to revise and adapt existing courses of study so as to include elements found to be essential to an adequate program in this field.

3. Study what the outstanding and more progressive school curricula and programs are already doing to teach useful attitudes, skills, and habits of conservation, prepare descriptive accounts on what is being done in such educational centers, and disseminate these reports for the guidance of educators generally.

4. Study practices of teacher training in the field of conservation, test the various teacher-training curricula to determine those which

are most effective, and disseminate the products of such studies for the guidance of the various teacher-training institutions. Counsel with and stimulate teacher-training institutions to make all prospective teachers not only conscious of the various outstanding problems of conservation but skillful in properly instructing pupils concerning these problems.

5. Study and report how the extra-curricular and other activities now playing such a large role in educational programs can contribute to the various aspects of an adequate program of education for conservation. It is evident that various kinds of school organizations, such as the Future Farmers of America, and plans for enlisting the hobby and other natural interests of children and youth, can do a great deal to teach the prevention of fires, the protection of wildlife, and similar essentials of a program of conservation.

6. Study and report how agencies auxiliary to the schools, such as the Boy Scouts of America, Girl Scouts, 4-H clubs and other youth organizations, can contribute to a program of conservation education.

7. Study and report how the adult-education programs, more recently developed in connection with our systems of education, such as public forums, adult classes, community programs in dramatics, debating, hobbies, etc., can best contribute to the solution of the problems of conserving the natural resources.

It would seem that while the Federal and State Governments are engaged in the terrific and somewhat dishartening struggle to repair by direct methods the damages which have been done to our forests, lands, streams, and wildlife, by the ignorance and indifference of our citizens, a small appropriation for education, through which there can quickly be put into the minds of millions of people the challenge to conserve what we have left and to rebuild our lost fortunes, would be the most profitable of all investments.

Just before I came over here I picked up this volume which is the account of last year's meetings of the National Education Association, the department of superintendence of that association meeting last February in Atlantic City, and the association itself which met last summer in Denver.

I have looked in vain to find anything among at least 1,500 discussions in those two meetings that suggested a direct interest in the conservation of natural resources. I venture the assertion that in the meeting of the department of superintendence, to be attended by 10,000 of the leading educational administrators of the United States the last week of this month in St. Louis, there will not be a discussion, among a thousand or twelve hundred, on this important subject which you have come here to talk about in Washington.

This meeting is interesting to me. It is always interesting to see people, laymen, come together with great impelling motives and interests, when these people seem to be calling out in the dark for Americans in general to understand what these people are trying to do.

Education is always relative to need. In the good old days the boys and girls got a very good education with a mediocre mechanism called school. In fact the best school was in the home and the shop where the mother and the father taught the boys and the girls. But times have changed. We have lugged along, how-

ever, many of the old notions in education. While I could give you a long lecture on how education has improved, let it suffice to say that now education must be much more responsive to current social needs than it has been in the past.

Here is this great social mechanism enrolling 30 million students in the schools every day. You are down here together with many other specialists in Government departments and bureaus engaging in conservation in its various forms. You have available vast quantities of interesting scientific information about this most compelling problem. Now what is the problem for us? Obviously it is to do what a Federal Office of Education ought to do and what it was established to do, namely, to promote education throughout the United States.

If we had a small division of conservation education in the Office of Education we could go out into the States, we could induce every State department of public instruction to establish a committee on the study of the best ways and means of injecting into the school programs and curricula the study of conservation from the kindergarten through the university. [Applause.] Then what would happen? The local school systems, county school systems city school systems, town school systems, would establish their local course of study committees, as we call them, and they would begin to study the problem to see what they can do in terms of their own local situation. Then what would happen? After we in the field of education actually create patterns of teaching and curriculum plans which are somewhat uniform, publishing houses of the United States and other agencies interested in the preparation of instructional material will get busy; they will produce the most delightful, interesting, challenging materials for young people and adolescents and adults to study that have ever been developed for school use. [Applause.] You can't get that done. The publishers of this country won't do it now because they do not see a market for it. Here and there you see in the courses as I have intimated in this brief statement some evidence of interest in conservation. Why should we spend long hours teaching these boys and girls about how and why Hannibal went over the Alps and of the intrigues of the Roman Triumvirates, and fail to teach them how to preserve what really provides the very sustenance of their lives? [Applause.]

I think you would be surprised and so would the Federal Government to see what could happen as the result of an expenditure of about $35,000 a year in the Federal Office of Education to promote conservation education throughout all the States of the Union. I am really amazed to see the extent to which some of these very vital problems are not at all represented in the Office except, as I said, in the Division of Vocational Agriculture. Our job obviously is to take these great big problems out here in a rapidly moving civilization and by the techniques of education transform them into usable policies and procedures, thus securing for them proper recognition in the system of education of the United States. You can be sure that I will help do it if I get a chance. [Applause.]

Chairman GABRIELSON. I am quite sure Dr. Studebaker gave you something to think about.

This program has been designed this morning to show the different avenues available in the conservation movement if we choose to take advantage of them. I think in many cases we have failed to do so and it is our own fault.

We have a different type of education represented by the next speaker. The possibilities of contributing something to the solution of the wildlife problem through the Extension Service and particularly through the work with the 4-H clubs are very great.

Remarks of Dr. C. B. Smith

Dr. C. B. Smith, Assistant Director of Extension in the Department of Agriculture, will present this subject. Mr. Smith. [Applause.]

Dr. C. B. Smith. Ladies and gentlemen, when the tumult and the shoutings die and the captains and the kings all depart, it will largely devolve upon the various agencies of government, Federal, State, county, and school district, to carry out and make effective the aspirations and wishes of this great conference.

Dr. Studebaker has outlined to you in a fine, big way the part the public schools may play in the restoration and conservation of wildlife. I shall attempt to bring to your attention in a 10-minute paper something of the place the Extension Service of the United States Department of Agriculture and the 48 State agricultural colleges of the Nation are now playing and may play in the future in this work.

The limited work thus far undertaken in wildlife fields by Extension forces has been largely through its boys' and girls' 4-H clubs and chiefly in the States of Minnesota, South Dakota, Iowa, North Dakota, Nebraska, Missouri, Wisconsin, Michigan, Illinois, West Virginia, and Massachusetts, though some work has been done in about six or seven other States. State conservation departments, State game and fish departments, State game wardens, Izaak Walton Leagues, Audubon Societies, and other organizations and individuals interested in conservation of wildlife, have all been instrumental in stimulating agricultural Extension forces to undertake work in the field of restoration and conservation of wildlife.

The work is proving fascinating to the youth engaged in it and promises to become one of the most interesting and widespread features of 4-H club work. It awaits only proper introduction, coordination, guidance, and literature to make it a significant part of extension work in practically every State and every rural county of the United States.

What is being done now in a few States may be cited as typical of what may later be developed in all States.

In Minnesota, conservation work is made a part of the work of all 4-H clubs. There are 2,600 local clubs in that State, with a total of 43,000 members. A period of 15 to 20 minutes of each regular meeting held by each club is given to the consideration of wildlife matters. This activity by the 4-H clubs of Minnesota was stimulated by the offer of a thousand dollars by a business man from the Twin Cities. A part of this fund was used to establish a 4-H conservation camp on Lake Itasca. The camp site and

buildings are owned by the forestry department of the University of Minnesota. A trip to this camp was awarded to the 4-H club member in each county who had done the best piece of conservation work. Winners of State honors were awarded trips to State and national events, scholarships, and other forms of recognition. An essay contest on the subject, What our club has done in the conservation of wildlife in our community in 1934, also was held. Seventy-four of the eighty-seven counties in Minnesota participated in this essay contest.

The following statements taken from the reports of club members in Minnesota indicate the character of wildlife conservation work undertaken in that State by 4-H clubs, and these are some of the quotations:

Built 17 bird houses and learned how to cut wild flowers so as not to injure the plants.

Built a bird sanctuary and gave several demonstrations.

Persuaded our folks not to burn some sloughs but to keep them for bird covers.

Arranged a bird house contest at the county fair and planned winter feeding of pheasants through the cooperation of the Izaak Walton League.

Learned to use a flushing bar for our mower; collected 75 pheasant eggs and hatched 60 young pheasants, liberating them when they were old enough.

Arranged for a small bird reserve on our farm and persuaded father not to burn some sloughs on our farm.

Our club helped to put out a fire. The members also put up signs on all our farms to obey all game laws. Members of our club each saved a big bundle of grain which was put up for bird food this winter. Our club conducted an "obey all game laws" campaign.

Made a bird bath and identified 91 birds using this bath.

Our club rebuilt a dam in a lake which had been drained and dried up, so that when rains come this lake may again be a home for waterfowl.

Classified and learned to know 75 birds and have set out much bird food in the form of suet, etc., during cold weather.

Planted wild plums and cherries in fence corners for future bird food.

Scores reported making bird houses.

Many 4–H clubs reported making feeding shelters for pheasants and many conducted campaigns against the enemies of bird life. One club reported killing 28 stray cats.

In Iowa a conservation camp was held as the climax of the first year of active participation of 4–H club boys and girls in this new and interesting phase of club work. Twenty boys and 20 girls were selected on a basis of their accomplishments in conservation, as well as other club projects. The first day of the camp the theme was Fur-Bearing Animals and the Fishes of Iowa Waters; the second day the boys and girls discussed Birds; and on the third and final day of the camp, Trees, Shrubs, and Wild Flowers came in for their part in the conservation program.

Members of the Iowa Conservation Commission, the staff of the wildlife research department of Iowa State College, interested business men, and the 4–H club staff of the college cooperated in making the program interesting and educational.

Nearly 2,000 club members took part in the first year's conservation work in Missouri. More than 60 of them attended a conservation camp during the last part of October. The 4–H club members were housed in the quarters used by the Civilian Conservation Corps during the improvement of Montauk State Park in Dent County. Here in this extensive conservation project they were the guests of the Missouri Game and Fish Commission and cooperating agencies interested in the various phases of conservation work.

The camp was under the direction of the State 4–H club staff. The educational features of the activity included discussions of soil conservation, identification and methods of protecting birds useful to man, identification and methods of eradication of harmful weeds,

the propagation of shrubs and flowers, and the conservation of native wildlife.

Nebraska had its first conservation and restoration of wildlife camp at Seward in 1935, with about 100 4–H youths and adults in attendance. One day of the camp was designated as wild animal day; another was dedicated to birds; plants were the subject of the third day, while the fourth day was fish day, in which a fishing contest was staged.

Perhaps this is sufficient detail to show you the character of wildlife preservation that is being undertaken in modest degree by the 4–H club members of the National Agricultural Extension Service.

As to adult work in wildlife conservation, carried on by extension forces, probably more has been done in the control of rats, ground squirrels, and prairie dogs than in any other phase of the work, and most of this work has been carried on in cooperation with and under the guidance of the Biological Survey of the United States Department of Agriculture, cooperating with State agencies. A very large amount of work has been carried on by adults in practically all States in the planting and care of forest wood lots, windbreaks, and shelterbelts.

A word now as to the potential significance of the Agricultural Extension Service in promoting the restoration and conservation of wildlife. The Extension Service, which is entirely an educational organization, is made up of nearly 8,000 State and Federal employees, all technically trained in the fields of agriculture and home economics. Every rural county in the United States has one or more of these agents located permanently within the county and available for work with farm men, women, and youth in stimulating interest in the various phases of agriculture and home economics, including the restoration and conservation of wildlife.

This group of technically trained men and women agents deals with between three and four million farm men and women annually and has enrolled around 925,000 boys and girls 10 to 20 years old in 4–H clubs and 36,000 more 18 to 30 years old in rural youth clubs.

The organization needed to utilize most effectively part of the time of these extension agents in promoting the restoration and conservation of wildlife would seem to be two or three agents in the Federal Extension Service, cooperating with the Bureau of Biological Survey and the Forest Service and employed to give their whole time to promoting this work through the State and county extension services.

There should also be one or more persons in every State extension service to help State extension forces understand the significance of the work in every county, and assist in its organization and development, and to work through the State and county extension organization in the most effective way.

It has been our experience in Extension work that you make progress fastest when you have have someone whose special job it is to promote work in a particular field and to give their whole time to it. Without such special agents either in public or private business, men who give their whole time to the job, the enterprise is likely to slumber and sleep with no great progress being made.

With such additional wildlife help in the Federal office and in every State, you would have a group that could work with the State

conservation department, the State game and fish department, the State and county game wardens, Izaak Walton Leagues, Audubon Societies, and other similar groups in developing plans and programs for the promotion, care and preservation of wildlife in every nook and corner of the United States, Alaska, and Hawaii, at a cost to the Federal and State Governments that would be most modest and most effective.

In closing this paper, I leave with you the following thoughts.

Agricultural Extension forces are beginning to do some educational work in the restoration and conservation of wildlife.

Most of the work thus far done has been carried on by the boys' and girls, 4–H clubs.

Youth seems to be enthusiastic for this type of work. Knowing about plants, animals, insects, birds, fish, trees, and the like, bring them satisfaction every day of their life.

If this type of work is to be promoted more largely through the Agricultural Extension Service, there would seem to be needed two or three Federal Extension agents and an Extension agent in each state charged with the sole responsibility of developing this work through Extension machinery and cooperating with all State and private organizations, game wardens, and others, in the development of plans and programs for all phases of the promotion and conservation of wildlife.

We have not touched upon the educational work that might be done in the promotion and conservation of wildlife through Smith-Hughes vocational schools. We may add, however, that both these agencies, if properly approached, should be able to go far in promoting wildlife conservation. They are equally significant with the Extension Service.

We look upon the work by rural youth with the various phases of plants, insects, birds, animals, fish, trees and forests, ponds, lakes and streams, as contributing about as much to the abundant life as any one thing we can do in extension.

We can say to this conference, the Extension Service is squarely behind this great conservation movement and will play its full part in stimulating interest and knowledge throughout the Nation in the how and why of wildlife restoration and conservation. [Applause.]

Chairman GABRIELSON. Dr. Smith has told you something about the 4-H club work. We have on the platform here a sample of this kind of work: Jerry Flicek, age 17, from Minnesota, the youngest delegate in this conference, representing officially the 4-H Clubs of Minnesota and the sportsman club of his town, New Prague. When I look at the accomplishments of this young man in conservation work I am reminded of Mark Twain's old remark that has been quoted so many times, that everyone talks about the weather and no one does anything about it. I think there are a lot of conservationists that are pretty much in the same class. These youngsters in the 4-H clubs are doing a real work. This young man is the champion 4-H conservation boy of Minnesota. He raised and released 90 ring-necked pheasants, planted 2,000 trees, maintained 12 feeding stations for upland game and birds during the winter, made a complete survey of his own farm to determine the amount of natural habitat available, eliminated the stray house-cats, made a study of

the food habits of the insectivorous birds on that farm, and their value, and did many other things to develop a well-rounded conservation program on the farm.

He is one of a hundred thousand farm boys that accomplished something of a constructive nature in carrying out the 4-H club program in 1935. This is a real avenue for educational work in conservation. I am going to introduce this young man.

Remarks of Mr. Jerry Flicek

Mr. Jerry Flicek (New Prague, Minn.). Mr. Chairman, members of the conference, ladies, and gentlemen: When you go home to organize your State, see to it that you have included as one of your major activities the promotion of the 4-H conservation program. The farm youth is in a better position to carry out real constructive conservation programs than any other organization in existence. Don't worry about the youth of tomorrow. We will take care of ourselves. [Applause.]

Chairman Gabrielson. I just wonder how many of us have actually done as much as this youngster has for conservation personally in the past year.

We have another side to the educational possibilities that has been used and I think can be used very much more in promoting wildlife. That is the press.

We have with us to discuss this subject Tom Wallace, editor of the Louisville Times, from Kentucky, the man who led the successful fight for saving Cumberland Falls. Mr. Wallace. [Applause.]

Remarks of Mr. Tom Wallace

Mr. Tom Wallace. Mr. Chairman, ladies and gentlemen remaining after the exodus which followed Secretary Ickes' speech: This problem is of such enormous importance and so near my heart as a newspaper man and as a conservationist that I think it really calls for a sample of the eloquence for which my State was somewhat famous in the days of W. C. Breckinridge and his contemporaries, but unfortunately I discovered some time ago that I did not possess the quality of eloquence.

I found it out in this way. A speaker for the Forestry Department told me that you must appeal to audiences through their hearts rather than their minds, that you must emotionalize your subject. I got him and I tried it. I worked on a piece of oratory and polished it for weeks and got it down to where I thought it compared well with Robert G. Ingersoll's Eulogy of His Brother Eben at the Graveside, or Senator Vest's Eulogy of the Dog, or Henry W. Grady's speech on cotton, and I tried it in Columbus, Ohio, at a sportsmen's meeting, and the audience was as unemotionalized as this one is now, or will be when I conclude.

I tried it again at Washington Court House, Ohio, with identically the same results. Then I said, "I will go to God's country, where the finer things of life are appreciated." I had an engagement in W. C. Breckenridge's town of Lexington, in the Gold Room of the Lafayette Hotel, and I used that same eloquence and I received an ovation. I wasn't carried on the shoulders of the audience as I had

once seen Kubelink in Paris, but the next highest compliment was paid to me, and the highest compliment that any central Kentuckian can pay to any living human being—a gentleman said that he and my grandfather were related.

As I went out of that hotel and got into an automobile with a fox hunter to go back to Louisville, he said what people customarily say to speakers, no matter how bored they have been—"That was a good speech", and I made the conventional response and said, "Dr. Casper, it was a good audience and a good audience always helps."

He said, "It was the largest and most representative audience of sportsmen that ever got together in Kentucky, but did you ever see an audience with as much whisky in it per capita?" [Laughter.]

Since then I have had to confine myself to the conversational style.

We are met here today to consider a project which as it relates to game and fish alone can be demonstrated to be worth potentially at a very conservative estimate $500,000,000 a year in direct revenue, not in indirect, but in direct revenue.

Well, what publicity are we getting? And remember that what we say to each other doesn't have great effect. The indirect audience is the audience we must reach if we are going to get anywhere. I speak advisedly on that subject.

Your chairman has mentioned that we had a fight on Cumberland Falls in Kentucky, and I will refer to that again. But to make a long story short, by a little publicity beginning in one newspaper and in 2 years spreading to only three newspapers but in 5 years spreading to 95 percent of all varieties of publications in the State, we took away from the Insull interests at the time that it was said that Samuel Insull was giving to Chicago heat, light, power, grand opera, and United States Senators, an already acquired property held in fee simple by a utilities company and made in a State park. That is what publicity will do. But you have got to get it in the papers.

This morning—here is a conference called by the President of the United States, addressed by the Secretary of the Interior—I picked up the newspapers to see how much publicity this conference was getting, and here is a little list of the two-column heads; I didn't find it anywhere on the front page of any paper at all; I found it on the fourteenth page of the Washington Post.

Here is a list of two-column heads: "Olympic Games Draw 806,000 People." Another one: "Chaplin Film Riot." Another one: "The One-Pound Baby Lives." Another one: "The Morgan Partners Are Sorry." Another: "The Kisses of the Duchess Are His for Sure." "Women Arrested by Poker Raiders." All those things, of course, are very important, but so is this conference, and yet you don't find much about it.

One of the most important things in getting publicity is the place of the conference. Now, the headquarters of this Wildlife Institute are probably necessarily in Washington. The two worst places to get publicity, the three worst places I should say, for meetings of this kind are, in the order named, New York, Washington, Chicago.

The American Game Conference used to meet in New York and those attending it didn't have to bring their golf clubs because they got sufficient exercise running through the newspapers of New

York to see if there was any news of their conference. There wasn't, to amount to anything.

If you go to a smaller town there is a sense of obligation and of hospitality and you get more news. New York is not much obliged to anybody for anything or much obliging; it is too big and too busy, and when you meet there with this kind of conference they sell you down the river. They don't think it is important, the news editors don't think it is interesting, and very little attention is paid to you. If you were to have a free-love conference in New York it would be on the front page of all editions of all newspapers, but this sort of stuff is considered by news editors dull. If you meet in Washington or Chicago there is somewhat more publicity, but if you meet in Washington you fail to get very much publicity because here politics is the only news, as free-love would be in New York, and there are some points of similarity between the two subjects. But if you do have to meet here, then there remains the problem of how to get into publicity elsewhere and all the time.

The commonest way of trying to get publicity is to write articles, mimeograph or print them, and send them to newspapers widely from some central point of distribution. That is a very ineffective way. Newspaper offices are in constant wonderment as to why so much money is spent for publicity that is well written, well prepared, and widely distributed, and goes from the editor's wastebasket into the baling machines that bale the refuse paper, without ever being read or looked at. There isn't a possibility that any newspaper editor will ever have time to give judicious consideration to one-tenth of the publicity that comes to his desk.

If any newspaper editor made a New Year's resolution to do that and tried to keep it, he wouldn't live out the year. The editor who is able to read all that gets into a newspaper is a rare bird, and what gets into his paper is very little compared to the really usable material that comes to it and doesn't get into it after the news editors have winnowed the news, separating the chaff from the grain, and, as some people believe, publishing for their customers the chaff instead of the grain.

It doesn't do much good, it doesn't make any difference how well your articles are prepared, to keep on shooting them at news editors as compared with other methods of approach which I want to mention.

Insofar as you are to depend on that sort of distribution, that approach to the papers, your publicity bureau should be captained at least by a man (or a woman) who has had adequate and successful experience as a reporter. Much of the stuff that comes to newspapers is not prepared by people who have any understanding of news values, so if it were considered it wouldn't be fit for print. They may know everything in the world except what newspapers will print.

The former reporter (and I am not trying to get any young man a job) will know various devices by which to get into papers; he will know what kind of papers use what kind of articles; he will know how to attract attention, how to dramatize his subject; ne will know that if he gets some facts that will make a story and gives it to an enterprising reporter it will be more likely to get into the

papers as news than if he prepared an article and sent it to some man in shirt sleeves on a news desk. The psychology of the situation is against him when he does that because he pitches in his stuff with bales of other stuff that that news editor is not going to look at.

The reporter, if he knows his business, will know that, for example, the much-discussed and widely believed dead editorial page is, in many newspapers, in most newspapers, perhaps, a better medium than many of the news columns. And why? Because in these days when the afternoon papers begin to come out in the early morning and the morning papers begin to come out in the late afternoon, there are many editions, but the editorial page runs through all editions.

I was in New York during the Cumberland Falls fight to make an address at the Wanamaker Auditorium, which is pretty far downtown, and I dropped in at the Times office and told a friend of mine there that I hoped humbly that he would report that meeting because I was there from a considerable distance propagandizing in behalf of a cause that I believed was of enormous importance. He said that the meeting probably would be reported and that the article probably would be used unless something unusual should happen during the night. Now something unusual usually does happen in a newspaper office during the night, although that is a seeming paradox. But the Times did report the meeting, but my friend on the news desk said, "If you really want publicity, why don't you write a letter to the editor?"

I went over to a hotel and dictated a letter to a hotel stenographer and submitted it. I got many more returns from that letter to the editor than I got from the news article in the Times about the same length, although the Times is deservedly considered the greatest newspaper in the world because of the news it publishes. So don't forget the editorial page.

Don't forget the importance of contacts. Many of the most high-powered publicity bureaus now, especially those of great corporations, are contact publicity bureaus rather than release-submitting publicity bureaus.

Anyone who has a good cause against which no newspaper is arrayed, a non-profit-seeking cause, can approach newspapers as a contact man without any fear of meeting with any opposition. All he has to do is to convert somebody. It is just as easy to convert a publisher as it is to convert a copy reader.

To give you an example, over in Cincinnati a few years ago some of us were discussing the filth in the Ohio River caused by sewage. It was said in the presence of one of the publishers of one of the Cincinnati papers that the thing had gotten to the point that the official purifiers of sewage couldn't quite accomplish what they were trying to do and that the water was sometimes unpalatable and sometimes dangerous because of that. The publisher didn't believe it. The chemists soon showed him that it was true and he threw open the columns of his paper to the antipollution movement. It didn't take any more trouble than it would to convince the reporter, but when you convince the man in final authority you get the paper on your staff, and that is what you need, because the interest of the newspapers is vastly more valuable to you than any releases you

can give the newspapers. The newspaper then will make its own news.

The good press agent knows that when he has a non-profit-making cause he can approach the editorial writer and interest him and have, from time to time, articles that do not originate in the publicity bureau and are better than any publicity bureau turns out.

Your trained newspaper man will understand the value of getting into the press services as against getting into the individual newspaper, and he will learn it is not much harder to get into the Associated Press and the United Press with an article of general interest than to get into one newspaper. He will learn the value of the syndicate cartoon. I don't believe anybody ever converted Jay N. Darling, but if any press agent had converted him and caused him to do what he has done for conservation, it would have been worth 40 bales of printed releases in the form of publicity.

When I was making this Cumberland Falls fight I dropped into Washington one afternoon and fell into conversation with a man who publishes a syndicate letter, and I told him what I was trying to do.

He said, "That's a story for me. But," he said, "the story for me is a newspaper man who has become a conservation fanatic and who is running about over the map, ranting about a waterfall which already is possessed by a utilities outfit which commands, perhaps, a billion dollars, and this newspaper man thinks he can get it away from those people."

I said, "All right; you write it."

He said, "Not I. You write it."

I said, "All right, I 'll write it." So I wrote it in the third person in exactly the mood he suggested, and it went to a circulation totaling millions, and it did some good. I might have submitted that same article to any number of syndicates and I wouldn't, perhaps, have gotten it into a single one.

So the personal contact is the thing.

I am not going to take up much more of your time, but I do want to say that the small newspapers should not be overlooked. I mean by that the county weeklies, for they are the newspapers that your lawmakers particularly consider. I don't know what your financial resources are, but I think a movement of this kind should have in every State, if possible, or at least in each of several carefully considered regions, a traveling representative capable of presenting this cause adequately to newspaper editors individually and to press associations at their annual meetings.

What we need is not the acquiescence and the occasional applause of newspapers, but their militant missionary interest, and we need, therefore, publicity bureaus which have the missionary attitude and capacity. Now, missionaries to China may work out of London or New York, but they work in China; they go and live with the heathen and convert him by contact, and that is what you have got to do with the press. There are just here and there a few newspapers who are militant. I believe it was intended originally that Karl Bickel, of the Scripps-Howard alliance, was to make this address. Now, the Scripps-Howard papers are pretty good on conservation, and the fact that Karl Bickel was considered, if that is the fact, and

I believe it is, was because of that. Convert a man in Bickel's position, and you convert 20 or 30 newspapers fundamentally. That is the way to get at it—go to the top.

A college professor said some time ago to a young man, "Don't try to marry the boss's stenographer, try to marry his daughter; it's just as easy and it's a great deal more profitable." That is what you must do in getting publicity in newspapers.

I thank you for your patience. It is always a pleasure to get out of the hurly-burly and the anxieties of a newspaper office and come to some peaceful scene in which no matter how much you may torture any soul present he can't do anything to you, because you know in the newspaper business there is always somebody coming in with a grudge and expressing it violently.

I remember some time ago, prior to national prohibition when Kentucky was about 118 counties dry, they charged a man down in southern Kentucky, Bowling Green, with having possession of liquor for sale. The allegation was based on the alleged proof that he had conveyed three truck loads of whisky to his home in 3 months, and his response was it was for personal use. I thought that was a good thing to write an article about, so I defended the gentleman by saying than anybody who knew the Colonel knew that once in possession of a good beverage whisky he wouldn't part with it for sordid money, gold—they had gold in those days.

Some time after that I heard a great gruff voice in the corridor outside my office saying, "Where is this man Wallace's office?"

Some still, small voice must have answered, because I heard an elephant tread down the corridor and in a little while I looked up and the largest, able-bodied man—not counting fat men in circuses, and this man wasn't fat—that I had ever seen stood entirely filling up the doorway to my office, which was the only exit except a third-story window. He looked like he would have filled one of those gilt doors down at the other end of this auditorium. That impression was not made on me because I knew who he was; I didn't. I was admiring his magnificent physical proportions when he said, "My name is Colonel Jones, Tom Jones of Bowling Green." Then I knew why he had called. I wondered if he was the kind of man who shot editors or mauled them to death. I hoped he would shoot because it seemed so much more dignified to die that way.

I was thinking whether or not the life insurance, after the slight borrowing on it was paid, would get the widow back to her people, but I thought I put a brave face on it and I said, "Colonel Jones, I am glad to meet you. What can we do for you?"

He advanced with a fist that looked as big as a Westphalian ham, unrolled that fist and said, "Old man, I just wanted to shake hands with you because you're the only one who took my side in that whisky case." [Laughter and applause.]

Remarks of Mr. Jay N. Darling

Mr. Jay N. Darling. I have been asked by the permanent chairman, Mr. F. A. Silcox, to say that there will be no session on Friday afternoon for the consideration of resolutions. As you recall, the

B3627M

A, Canada grouse perched on limb. (Biological Survey photo.)

B5032M

B, Framework for lean-to feeding station for upland game birds. (Biological Survey photo.)

B43034

A, Snow plow clears the way for a truck with feed for wild ducks at the springs in the National Bison Range, Mont. (Biological Survey photo.)

B43021

B, Elk on the National Bison Range. (Biological Survey photo.)

committee of thirteen yesterday, having looked over the group of resolutions, found none with which we could accomplish anything by passing them. Furthermore, we have no federation as yet authorized to pass any resolutions. We have no authorized voters. These resolutions which have come in to this conference will, therefore, be held over until the meeting of the authorized conference when the constitution has been adopted by a majority of the States and at that time reconsidered. There will be no resolution session on Friday afternoon.

Second, the momentum of State organizations must not be lost. I am very anxious that before the delegates leave the city we can have group meetings, and I would like to meet with every State group here. If you haven't enough nucleus for States, get together by regions. I am devoting all my time to those State meetings and regional meetings from now on. I think we can generate sufficient momentum to carry this thing for the next 2 or 3 weeks during the preliminary organization.

I have to leave that calling together of your State groups to you; if you will let me know when you can meet and want me there I will be glad to come.

Those two items conclude the announcements that I have to make, but I wanted to emphasize that very important statement that Mr. Studebaker made this morning with reference to Tom Wallace's publicity, which was excellent and no one appreciates it more than I do—I have been in the business for about 30 years. I was thinking of the 30,000,000 people in the schools that Mr. Studebaker spoke of, 30,000,000 every day, and no approach to them, and that the $35,000 which he said it would take to set up a department in the Office of Education was about the cheapest publicity we could ever get because it wouldn't be just one story, it would run all through the year. I wonder if we shouldn't consider that as one of the objectives for direct, down-the-line conservation work. Thirty million students in school every day and not any publicity, no official teaching excepting the desultory efforts of those whose enthusiasm has carried them on to do a little of it in a voluntary way. I just want to make that point a little more pertinent because I think it is important that when we get our jobs under way we may want to consider that kind of a project.

You know that $35,000 was in the educational budget. Mr. Studebaker had it in there, and it got by the Interior Department but was cut out in the Budget hearing. The only place you can get it back is by telling your Congressman that that ought to be there.

Chairman GABRIELSON. The next speaker on this program has been doing a real service to the conservation movement. Through him for 2 years there has been running this conservation-day program on the National Farm and Home Hour every week. Mr. Frank E. Mullen, Radio Conservation Council, Radio Corporation of America, will tell you something about the work of radio and the radio possibilities in a wildlife-conservation program. Mr. Mullen. [Applause.]

Remarks of Mr. Frank E. Mullen

Mr. Frank E. Mullen. Several years ago I entered, more as a hobby than anything else, the conservation movement, and I was just recalling that along in 1923, I believe it was, we started Radio Chapter No. 1 of the Izaak Walton League in Pittsburgh, Pa., and we printed membership cards in this radio chapter. One of the first applications which we received came from a miner in a coal mine, and he wrote out his card a mile underground.

Since that time radio, I think, has in its progress of development contributed something to the cause of conservation, but, of course, the surface of its possibilities and its potentialities are not even scratched.

Now that we have this federation all formed and peace and harmony reigns supreme, I want to start another thing; I want to start a movement to conserve radio time, and the time used by radio speakers and the patience of the radio audience.

One of the nice things that might come out of this federation is that radio folks will only have to put one speaker on hereafter to represent all of the agencies of conservation instead of 25. Whether all the organizations appreciate that or not I am a little afraid that the audience will.

However, it seemed to me this morning that in 4 or 5 minutes I might give you some practical suggestions that you could carry back to your States and your districts, because as you do get organized locally to carry out this work naturally you want to use the radio.

The national job on the two or three major networks of the country can be done by the national organizations, but the State job must be done locally. I think I can speak in behalf of the radio industry generally that it stands ready to cooperate. It has in the past, and I am sure it will in the future.

The principal difficulty that has been faced, however, by the radio industry has been, as Mr. Wallace has said, the question of getting news. You know, I have a suspicion that many of the newspapers of the country don't use publicity releases because there is no news in them or they are dull. The same problem confronts the radio-station manager.

Just to illustrate, after several years of experience we classified audience preferences fairly scientifically. I am sure this classification will appeal to you as being more or less obvious. The radio audience wants first, music; second, news; third, drama; dramatic things; fourth, dialogues, debates; and fifth and last, talks. Yet anyone who approaches a radio station in the interest of promoting a movement always proposes to talk, and as is illustrated in this meeting here this morning where we started out with a pretty good audience and are now down to the patient and long-suffering people who will stick to anything, talks wear you out any time, anywhere, and particularly on the radio. The radio station manager thinks that he has done his part and I believe that he has when he offers time, but more often than not he has to go along and help prepare what goes into that time. That is not entirely his responsibility, and certainly if we want to promote conservation effectively then we ought to pay a little attention to the program, what we want

to do, what we want to say, and I have indicated here that last on the list is talks.

We have a fairly good illustration of what is possible to do on the radio in our Friday conservation program. I don't know how many of you have listened to the forest rangers' sketch that was written by the Forest Service, produced by the broadcasting company, but every Friday for about 3 years now we have been presenting a dramatic sketch portraying the life on a national forest. There is a little story of Ranger Jim Robbins and his young assistant ranger, a school teacher, Ranger Jim's wife; they are living people, they are a family. They have all sorts of experiences, a little love, romance, drama, tragedy now and then, all of the elements that are interesting so that that program is interesting to anybody whether he is concerned with conservation or not, but you couldn't possibly listen to that series of sketches over a year's time without getting sold on the national forests and their possibility.

I mention that as one of the real considerations that you should give to the use of radio.

You will find the station manager more than willing. If the local groups, the local women's clubs, and the local chamber of commerce and the Izaak Walton League and the Audubon societies do really get together out in county units and in State units, I can see the building of a program there that a radio-station manager would be eager to get, tremendously eager to get, because most station managers are civic minded, good citizens, and very willing to help, particularly in a cause like this, and they would welcome the support of a federated group such as we hope to get together in this organization.

I could talk with more enthusiasm about some of the elements of conservation because this is trade business to me, talking about radio. I do think it is important for you to appreciate that we have in the United States some 20,000,000 radio homes, and if you can get the cooperation of the press, which I am sure you can, and the cooperation of the radio, and then your school system, which I agree with the speakers who have preceded me is most important, and the cooperation of the farm youth, we can really move in on acquainting the 90 per cent of the public in this country who are indifferent, apathetic, and know very little about conservation.

We have been spending most of our time talking to ourselves on this subject, and the job is to acquaint the general public with the needs of the conservation of wildlife and our other natural resources and to get enthusiastic public opinion in favor of the necessary measures that must be taken to conserve these resources.

Thank you very much for inviting me to this Conference. I have enjoyed being in it and hearing these various speakers, and I can assure you that so far as the National Broadcasting Co. is concerned we are always ready to help out. [Applause.]

Chairman GABRIELSON. I feel very kindly in the Biological Survey to Frank Mullen because he has given us some time on the radio to help put over to the public the story of our conservation work.

The next discussion will be by John H. Baker, executive director of the National Association of Audubon Societies, who will talk on Contributions of Nonsportsmen to Wildlife Conservation. Mr. Baker. [Applause.]

Remarks of Mr. John H. Baker

Mr. John H. Baker. Ladies and gentlemen, the Audubon Association is already battling in the front line for you and for your and your children's social, recreational, and material welfare through combating the principal forces of destruction depleting our wildlife resources. How? By fighting on national as well as local battle fronts such forces of destruction as pollution, erosion, wasteful lumbering, overgrazing, overhunting, unwise reclamation and drainage, invasion of wilderness areas, engineering projects damaging to wildlife habitats, and political appointments to Federal and State conservation agencies. Did you realize that, or did you simply think that the scope of our activities is limited to the stimulation of bird study, the encouragement of feeding stations, and the maintenance of sanctuaries? I wonder if you did.

I speak from the standpoint of the nonsportsman, although you will understand that my remarks are necessarily limited to discussion of points of view and activities of the Audubon Association, for which I am authorized to speak.

We are now guarding 286,400 acres with 56 principal species in 303 nesting colonies concentrated in 147 areas in 36 sanctuaries. We have brought back the American and snowy egrets, as well as the White Ibis, to abundance in the South. They were on the verge of extinction some 20 years ago. We are making progress in the restoration of the roseate spoonbill and the reddish egret. We are now guarding remnants of the great white heron, the ivory-billed woodpecker, and the glossy ibis, all of which are now on the verge of extinction as North American species. We have initiated protection this year of the Florida crane, the Florida burrowing owl and the Audubon caracara. In our sanctuaries we are protecting also puffins, guillemots, terns, plovers, eiders, ducks, geese, pelicans, black skimmers, oyster-catchers, and other species.

It is our view that such action constitutes an important contribution by nonsportsmen, although we have, I am glad to say, a very considerable number of sportsmen members who thus contribute to the sanctuary activity.

Dr. Frank M. Chapman once said that the egg of the murre might well be said to be diplomatic; although laid on a narrow shelf hundreds or thousands of feet above the sea, the shape of the egg is such that when disturbed it goes just so far and no further. I am going to venture, therefore, to touch on several issues which tend to divide some of us now seeking joint action to conserve and restore wild life, and in so doing I hope to be diplomatic. As more or less of a newcomer in the conservation field, I am impressed with what seems to me to be the fact that most of these issues do not involve a flat yes or no solution but that there is very great need of a somewhat new orientation of viewpoint in certain quarters.

It has been quite a common practice, consistent with human nature, to establish shooting grounds in the midst of a sanctuary, or in an area contiguous therewith, thus taking direct advantage of the concentration of waterfowl in the sanctuary by luring them to the enclosed or adjacent shooting ground. Would you say that those taking this action could be said to be actuated primarily by a conservation or restoration motive?

There is the question of predator control at game refuges and farms. There is wide variance as to the extent of this practice in different localities, but such control results in the destruction of many forms of wild life in the belief that this is desirable in order to produce, at the least cost, the maximum number of shootable targets or salable birds or animals. After all, the propagator rather than the native wildlife is responsible for the interference with the natural conditions.

The great horned owl, which is usually the most destructive winged predator at game farms and refuges, is not initially responsible, and might be heard to sing, if he could sing instead of hoot, that old ditty: "You made me what I am today; I hope you're satisfied."

We would encourage our game-breeder friends to recognize the fact that other people in the community may well attach as much or more value to the birds or animals being controlled as to the pheasants, rabbits or whatnot which are being artificially propagated. We would further encourage them to take pride in the minimizing of control rather than pride, as is now so often the case, in the extent of control, as evidenced by the common practice of nailing wings and feet to the gamekeeper's lodge or barn door.

The problem furnished by control exercised at fish hatcheries is essentially similar. We recognize that where the pond is sizable or the pheasants are out in the rearing field in the spring, it may be difficult to minimize control. We feel confident that the ultimate solution will involve natural control; in the interim we would urge consideration of screening of small pools and pens as an artificial compromise that would certainly lessen destruction.

We have examined the reading matter on the licenses issued to hunters and fishermen in the several States and find that in three cases the hunters are deliberately encouraged, by reading matter on the license, to destroy many forms of wildlife described as vermin. It seems to us that that viewpoint constitutes an inherited relic wholly inconsistent with the findings of modern unbiased research experts such as, for example, Aldo Leopold, of Wisconsin; Ralph King, of Minnesota; Paul Errington, of Iowa; and Walter P. Taylor, of Texas. I wonder if many of us may not have been reacting superficially to circumstantial evidence and in so doing have ignorantly acted against our own economic best interests.

There is a great deal of control of so-called predatory animals and rodents carried on, largely in the western United States, by Federal and State agencies. We are of the opinion that much of this is not only unnecessary but unwise, and is itself the primary cause of demands for further control of other species on which these animals have normally preyed. Probably those now asking for such control are only partially responsible for the conditions with which they have to contend as the result of land abuse. This problem is tied in with the whole question of range restoration, which is apt to take at least a generation even if the best knowledge and intelligence be applied to the solution. We would encourage the Federal and State agencies concerned to adopt a viewpoint of pride in the number of acres removed from the category requiring control rather than to take pride in the number of acres controlled.

In much of the control work in recent years the C. C. C. boys have been used and we view with abhorrence the instruction of these boys

in the distribution of poison. After all, we do not call upon the youngsters in the family to drown the kittens which are the result of our own past mistakes in cat management.

Quite a few of my hunting friends seem to feel that, because they pay a few dollars and cents for a license, they thereby acquire a sort of prior lien on the game and a prior right to determine the regulations as to its take. There is no legal justification whatever for such a viewpoint. What they buy when they get a license is a privilege to shoot certain wildlife species which are the property of the citizens as a whole. We would feel that the adoption of this conception that it is a privilege and not a right, and action consistent with that viewpoint, would greatly minimize friction between landowners and nonshooters, on the one hand, and the license-holders on the other.

The bulk of the funds received by the conservation departments and game commissions today is spent on artificial propagation of game species to be released to shoot. All too little is being spent for education, enforcement, and research. We feel that the time has come, therefore, to ask our legislators to appropriate money from the general tax pot for at least a generous proportion of the expense of the protective agencies. [Applause.] Until such action be taken, we shall doubtless continue to witness totally inadequate expenditure on education, enforcement, and research. The need of this action is, in fact, rather implied in the calling of this conference on the basis that all groups among our citizens interested in wildlife conservation and restoration, for whatever reason, get together for joint action.

I have ventured to make these remarks because I feel so strongly that the solution of the issues involved is primarily of educational character.

No matter what we do now to restore and conserve wildlife resources, there will be no permanency to the program unless we succeed in bringing home to our children the vital import to them of preservation of wildlife. We are coming to realize that the teaching of those qualities which make for good citizenship is of equal, if not greater, importance than the teaching of certain mental gymnastics which have long been in vogue. I hope that we are to enjoy that more abundant leisure of which we have heard so much; at least there seems to be a trend in that direction. What more profitable use of leisure can you envisage than appreciative use of the outdoors?

It is an interesting fact that a judge of children's court, who has kept a careful record for many years, has yet to find a single case of juvenile delinquency where the child had any appreciation of nature.

The old idea in nature education recognized the natural collecting instinct in children. Boys and girls like to collect most anything—discouraged nails and old tin cans—but the collections were usually an end in themselves and resulted in nothing more than piles of dried rubbish and pickled postmortems. There were also memory tests with badges awarded, and the children were little interested in the subject but wanted the badges.

We are trying to get teachers, youth leaders, and children out of doors, doing something for a purpose. Children brought into contact with the marvels of nature experience an emotional response to

beauty and an intellectual response to curiosity. We have enrolled over 5,000,000 children in Junior Audubon Clubs in the schools, and this current year, according to present indications, we shall enroll roughly 300,000. You will observe that we are just scratching the surface, inasmuch as some 37,000,000 children are now in the schools of the United States. We have no patent on our materials and ideas in connection with this work. We encourage you to make the fullest possible use of them.

Now, this furnishing of leaflets, with colored pictures and outlined drawings for crayoning or painting, and a button and a magazine to the teacher was well enough, but frequently it did not develop sustained genuine interest on the part of the child. What was the trouble? Well, teachers keep coming to us to ask how they can convey their own interest and enthusiasm to the children. The teaching of those methods is not part of the training of the teacher. Recognizing, then, the urgent need for adult training, we are establishing this coming summer, on the coast of Maine, the Audubon Nature Camp, primarily for teachers. The main objective will be to convey a knowledge of methods which have been successfully used in stimulating sustained genuine interest of children and others in birds, flowers, trees, marine life, etc. There will be no "ologies" and no pretense at scientific education. There will be concentration on field observation and on giving to each camper a definite project program for the ensuing school year or twelvemonth.

We feel that these educational endeavors of ours, through interest clubs in the schools and youth groups and through the nature training of teachers, are fundamental elements in the objective that we are all seeking, namely, bringing home to the children the vital import to them of the preservation of our wildlife. They are contributions of nonsportsmen to wildlife conservation.

We recognize the need of a syllabus and a pamphlet of source materials to aid those who may be confronted with the job of inaugurating the nature educational plan in any State. Too often there is a great deal of hullabaloo about the importance of making nature education part of the regular curriculum, but when the law putting that idea into effect goes through, usually no one is ready with a plan and the working out of such a plan is neither easy nor can it be quickly consummated. We are working along these lines and will welcome the cooperation of others who may be doing so without our knowledge.

Let me repeat that the Audubon Association stands for the preservation of an adequate breeding stock of all forms of native wildlife and endeavors to arouse the public to act to preserve its rightful inheritance for its own social, recreational, and material welfare. Will you join with us, as we will with you, in efforts to bring about a happier and brighter future, in which nature appreciation may be widespread and the problems of enforcement and regulation consequently greatly minimized?

Thank you very much. [Applause.]

Chairman GABRIELSON. So far the discussions this morning have emphasized the educational phase of the wildlife-restoration problem. There is another phase which is of equal importance, the restoration of wildlife by management. We have Aldo Leopold with us to discuss the management by private agencies. It isn't necessary for me

to tell this audience who or what Aldo Leopold is. He is known to all and he always has something very worth while to contribute. [Applause.]

REMARKS OF MR. ALDO LEOPOLD

Mr. ALDO LEOPOLD. Mr. Chairman, gentlemen, no rounded program for wildlife is possible unless it is applied on private as well as on public lands.

The truth of this assertion is obvious. It underlies the American Game Policy of 1931, and has since been elaborated [1] for the whole conservation field. I suppose the object of rehearsing it here is to remind us that the present expansion in public undertakings is lopsided.

I have said before, and here repeat, that there is danger of using the present scramble for public dollars as a way to forget our zero score in private conservation to date. I say zero because if all the private undertakings in North America were plotted to scale on a map, you would need a microscope to find one, and even then you would have to know where to look.

Few people as yet understand that wildlife is best produced as a thin crop. To get either quantity or variety you have to spread it over large areas. In my opinion, the entire remaining farm and forest area is none too large to provide wildlife for our 10 percent of sportsmen, and our unknown but equally important army of non-shooting hunters. I have estimated elsewhere [2] that the farm and forest area of Wisconsin would yield 17 upland birds per licensed hunter per year. To stretch production beyond this would mean costly artificial methods and unnecessary sacrifice of valuable predators. I think Wisconsin is about an average State.

I cite this estimate because there are still a few ill-posted land-planners and sportsmen who have rosy dreams about accommodating the whole shooting public on a few public shooting grounds. Let us by all means have public shooting grounds, but let us keep firmly in mind that game management must also accompany the greater part of all private farms and forests if we are to have even a sufficient game supply. To shrink the area ultimately means to shrink the percent who can participate. To expand the human population, of course, has the same effect. We can measure this in Germany, where despite excellent management, only 300,000 out of 62,000,000 people hold hunting licenses, or half of 1 percent. That is to say, Germany, with 10 times our population density, can furnish only a twentieth as many of her citizens with a hunting license.

Now, if the greater part of our farms and forests must produce, it follows that the public must own or operate them if it is to be the producer. Nobody can operate a property without living on it. I think the vital role of the private landowner needs no further elaboration.

The question of what particular lands should be or remain private is, of course, another question, and one which involves the quality, as well as the quantity, of wildlife. By quality I mean particularly

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[1] Leopold, Aldo. *Conservation Economics.* Jour. Forestry, vol. XXXII, no. 5, May 1934, pp. 537–544.

[2] Leopold, Aldo. *An Outline Plan for Game Management in Wisconsin.* Wis. Regional Planning Committee Report for 1934, pp. 243–255.

that wide range of species, including the rare ones, which constitute the particular charm of our native fauna. The rare species are often vitally affected by misplaced private land. Take the grizzly: Why have the Federal conservation bureaus extirpated the grizzly from all but a few of his last stands in the national forests? Usually because some isolated private rancher lost some sheep or cows. Why didn't they remove the ranch rather than the bear? Because, until recently, no appropriation was available for moving ranches. It is now about last call for evacuating a suitable grizzly range in each of the western national forest regions, and restocking it if need be. No conceivable success in multiplying ordinary game, or in building bear refuges in Alaska, would extenuate our failure to save the "white bear" of Lewis and Clarke. One key is the removal of misplaced private lands.

Not all of our important problems can be solved by readjustments of ownership or by the stimulation of management for shooting. Take, for example, the waterfowl and the thousands of small potholes on which they depend for nesting. The bulk of these are so scattered that public purchase is impossible, and certainly private management for shooting would be a doubtful gain over no management at all. By what means can these breeding ponds be kept undrained, ungrazed, and otherwise productive? I can't see anything but a public subsidy, scaled to reward productivity, and certified by field inspection. We have no legal or fiscal mechanism for such a subsidy. That is to say, our conservation organism has in it a big hiatus which, in our excitement over buying refuges and poisoning crows, we have overlooked. The international aspect of the problem also needs special consideration. I hope the new institute can start a process of experimentation to find ways to fill up this gap.

Even if it were geographically possible for public agencies to cover the needs of conservation, I am afraid it is humanly impossible to build a public organization equal to the task. I see in the history of the last 3 years much evidence that there is a maximum velocity for expansion of a bureau, beyond which more money ceases to deliver more results. There may also be a maximum size, i. e., mere bigness may in itself kill that inner something essential to effective work. I also suspect that cooperation between Federal and State agencies has often been inverse to their rate of growth. We must not forget the probability that there are intellectual saturation points, carrying capacities, vulnerability curves, and peck-orders in that aspect of human ecology which we call government. All this is mere observational opinion, but I offer it for what it is worth.

To sum up:

1. The present program is lopsided. The inherent properties of wildlife and land use call for moderate stands on large areas, rather than heavy stands on small areas. Management on large areas means management on private lands.

2. Some misplaced private ownerships must be extinguished to save rare species. The grizzly is an example.

3. There is need for a new mechanism to reward private conservation of small waterfowl breeding areas and other spots which the public cannot buy, which must be managed, but which should not be shot.

4. There are inherent limits of speed and size in the building of public conservation agencies.

Thank you. [Applause.]

Chairman GABRIELSON. We were late getting started this morning. The other papers will be heard later.

(The meeting adjourned at 12:25 o'clock.)

THURSDAY AFTERNOON SESSION, FEBRUARY 6, 1936

The conference was called to order at 2:20 o'clock by Mr. Seth Gordon.

Mr. SETH GORDON. This afternoon's session will be presided over by William B. Greeley. He is oftentimes confused with a former Chief United States Forester, but on his own account has been interested in conservation work for more years than I am old, having been actively at the head of the conservation committee of the Camp Fire Club for something like a quarter of a century, so he needs no further introduction to any conservation audience.

(Mr. William B. Greeley took the chair.)

REMARKS OF CHAIRMAN WM. B. GREELEY

Chairman GREELEY. My friends, after that flattering introduction I am very happy to say that I recognize in this audience many of the friends of a quarter of a century. Perhaps some of you don't want to admit it as readily as I do, but it is a fact that I have been associated with some of you for 25 years.

The printed program says that the opening address is by a gentleman who is yet to be named, and I suppose that that is a hint to the chairman of this session, but perhaps I got in office too quickly to take hints. At any rate, I am going to disregard the hint for a moment and speak to you very briefly on one feature of this work in which we are all so interested. You heard this morning an expression of the desire that we should all work together, and that I am heartily in favor of. We cannot succeed unless we do that.

I want to urge upon all a spirit of give and take, of recognition on the part of one another of what the others have done. You have heard, as I have heard, "sportsmen" used sometimes as an offensive term. I am here as the representative of two sportsmen's associations, and I am very glad to have the appellation of sportsman, notwithstanding the fact that my killing of game has been very limited. The gun to me has been an excuse for traversing the woods, more than an actual implement. I want to tell you very briefly something of the position that sportsmen have taken, and I shall use as examples the two organizations which I represent here and with which I have been connected for many years, namely, the Camp Fire Club of America and the American Game Association. Both of them are rated as sportsmen's organizations.

Now the Camp Fire Club of America was formed about 1892 by a group of men in New York City who had hunted in the wilderness; they were interested in the preservation of game. Their main object—and it has been the object of the organization ever since—has been to do what we can that our sons and our grandsons after us may be able to enjoy privileges which we enjoy and have enjoyed

in the past. It was in the early nineties that Shields, the chief organizer of the club, long before it was incorporated, brought forward the expression "game hog", and it was the primary purpose of those who were interested in the formation of the club to quell the "game hog."

That was before my time, but my association with the conservation work of the Camp Fire Club goes back to 1909, when the conservation committee was formed, and as early as 1910 we initiated a program for the institution of sanctuaries. At that time very few had heard of sanctuaries for game, but we adopted certain resolutions; and while we didn't have the money to accomplish very much, nevertheless we initiated the movement for sanctuaries.

It was not long after that that we took very active hand in the preservation of the fur seal, and it gave me great pleasure on one occasion to hear a Member of the House of Representatives who had been active in that work say that a great deal was due the Camp Fire Club in bringing about the preservation of the fur seal. We didn't take active part in any measures, but we did do what we could to stir up interest.

Just to give you an idea of the breadth of the conservation work of the club, I may say that at the request of the late Dr. Nelson, the Chief of the Biological Survey, we cooperated with him in the drafting of the Alaska game law. We were active and had a substantial part in the establishment of Mount McKinley National Park. We have been known through all these years as friends of the parks, and we have done what we could in our way to uphold the Park Service. The same has been true of the Forest Service, and of the Biological Survey also. We have done all that we could to help them wherever we could in carrying out their purposes.

Our work has not been all the time Nation-wide, for being a New York organization, although with members from almost every State in the Union, we have taken a very active part in legislation in New York, and we have appeared very often there before the committees of the New York Legislature. We had a great deal to do with the passage of the no-sale-of-game law. We were also very much interested and active in what was known as the buck law; that is, the law which forbade the killing of does.

Just a very brief word about the American Game Association, which was formed in 1911. It was shortly after the formation of the Camp Fire Club conservation committee, but we cooperated then with John Burnham, who was the first president of the American Game Association, in the organization of the association, and we have continued to cooperate with his successors; and I am confident that you will appreciate the fact that to us of the American Game Association conservation has been a live topic, when I name the three men who have been the active heads in succession of that organization, beginning with John Burnham, who, thank God, is alive yet and in good health, followed by Carlos Avery, beloved and lamented, and by Seth Gordon, who you all know now as such a live wire in conservation work.

I am not going to prolong this session by going into details. I simply wanted to remind you that sportsmen are conservationists—real sportsmen. I know that there are killers, that there are "game hogs" yet, perhaps, but the two organizations I have named are

not the only organizations of sportsmen who are sportsmen conservationists, and I hope that will be remembered now and in all the future work of this great federation.

Now we will pass on to the program.

The forenoon program was not completed, for lack of time, and Mr. Taber, of the National Grange, is the remaining speaker on the morning program, and it gives me great pleasure to present him to you. [Applause.]

Remarks of Mr. L. J. Taber

Mr. L. J. Taber. Chairman Greeley, Senator Hawes, and friends, I am happy to represent organized agriculture and to meet with organized sportsmen, organized conservationists, those who seek to build a more tolerable outdoors, and to preserve the finer things of life. I think it is extremely fortunate that this wildlife conference is called at a time when the attention of the Nation is focused to a peculiar degree upon agriculture. Since the decision of the Supreme Court dooming the A. A. A. we have found agriculture on the front page of the papers more often than either politics, war munitions, or the death of King George. And the reason is that there is an awakening in America to the basic relationship of rural life to the well-being of us all. We are slowly coming to realize that there is one bank in America that holds the assets of us all, that there is one bank that as long as it remains solvent we all can draw dividends from and all will be prosperous. That is the soil bank. That is the great outdoors, the heritage of us all.

Now, if we can develop an agricultural program of a kind and character decentralized, placing the responsibility upon the States and upon organized agriculture itself, if we can make the key of that program conservation of resources, we will not only be constitutional, but we will be intensely American and patriotic as well. [Applause.]

We can utilize this whole conservation program, this whole program for the rehabilitation and stabilization of American agriculture to advance and enhance the cause close to your heart and mine, that is the preservation of the wildlife of the great outdoors.

I think the time has come to be positive and not negative. I think we should pay farmers for doing things, not for withdrawing acres but for using acres, and I think we can find a way to so use that that we can conserve wildlife and we can add to the happiness and wealth and welfare of us all. I am one who believes that, for example, in the soil conservation program, if we will set up the responsibility that the farmer who will meet certain conditions where wildlife is propagated or who has a pond that will fit into the wildlife of ducks or of fish, they will not be compensated for not doing something, but for the aggressive, positive fact that he is doing something that blesses not only himself but all mankind.

I think it will not be difficult to devise a system of rentals and payments or benefits to work out a program where the farmer himself may find it adds to his own welfare and his own prosperity to develop game and natural resources.

Our farmers love nature. Most of them believe in conserving natural resources, but unfortunately economic pressure is sometimes so keen that it has been impossible for them to do what they should like to do. Here is the challenge that many people do not realize, that good agriculture, that clean farming, that attractive cultural methods, that make for the best agriculture make also for the depletion of wildlife resources.

I can remember my dear old grandfather urging me as a boy to mow out the fence corners of the old rail fence. He said, "Save the hay and make the field look a little better." You couldn't find anybody who would use a scythe now, but nevertheless that type of clean culture, no weeds, no grass in the fence rows, meant the destruction of the wildlife that we love.

I am not going to say that want any weeds to grow. Any conservation program must recognize the menace of weeds, but sweetclover, alfalfa, legumes, various types of hay, and grasses can be left and they can be made the home of the game.

I have sympathy for the farmer. Many of them are conservationists. Most of them love outdoors, but as is indicated sometimes the farmer sees himself feeding the game, 364 days out of the year, the quail lives upon his farm, he loves the music of bob white, the pheasant thrums down in the wood lot, and if he lives up in the foothills in scores of States, the deer may feed on his garden peas and his sweet corn, and yet 364 days of the year that game, that wildlife was on his own farm, he was unconcerned and undisturbed, but one day out of the year a sportsman with a high-powered modern rifle comes along and takes off his place or off his territory or out of his wood lot or off his farm that game. I am mentioning it because if we hope to make any progress we must recognize the rights of the landowner. So I rejoiced this morning in the discussion of this question and the emphasis that was placed on the fact that we have 6,500,000 farmers in America, and the number is increasing.

If we can interest those 6,500,000 rural people, if we can help develop their conservation program and an agricultural policy that recognizes not only soil conservation but the conservation of the flora and fauna of America, we can make the farmer the very bulwark in this program for the restoration of wildlife and for its conservation.

I am happy to represent organized agriculture and the Grange, and I want to pledge to you, to the officers of this new organization, and the workers, those who believe in conservation in all its phases, that here is an organization with 8,000 local units, a million members that will support a sound program. We met last year in our grange halls from Maine to California over 200,000 times, each one of those 200,000 meetings a potential spot for education. It goes right back not to paved streets, not to skyscrapers, but to the great outdoors where the farmer and his family, his boys and his girls, can understand the problems of conservation and the sound methods for the propagation of wildlife.

In many States the Grange has been active in its State-wide support of conservation and wildlife. In Massachusetts there has been a State grange bird committee for many years, and recently emphasis has been placed on the whole conservation program. At some

of their wildlife meetings, 2,000 patrons or more have been present. Equally outstanding is the work in Michigan where the State Grange has a State committee on conservation, and practically every Grange in the State conducted special programs during the past year. In one county, some Granges put on as many as five conservation and wildlife programs. Our members are interested in the broad program of not only saving the soil, but of protecting our forests and water resources at the same time. The Grange believes in a broad conservation that will improve our land resources, our wildlife, and give the blessings of forest, field, and stream—the national birthright of all—to every citizen.

I am mentioning that because this program will fail unless we tie in the farmer, unless we bring organized agriculture, the organized sportsmen and conservationists of America to see eye to eye to a sound constructive program.

I am one who believes that something can be done, that something has been done, and that there is more that will be done.

Like our distinguished chairman, I haven't too much patience with those who quarrel with those who love to hunt and fish. Do you know, if the Creator hadn't intended a fellow to catch a black bass he'd never make them tug like they do on the line. [Applause.] Twelve fishermen in the room. [Laughter.] I know when you get a black bass on the line—well, I don't care what you think about a lot of things, you are going back and try to get another one.

I can prove something else. It was my rare privilege to be director of agriculture in charge of the conservation of the State of Ohio, and some of my friends kicked because they said, "Taber is as much interested in the fish in Lake Erie and the quails in the woodlot down on the Roosevelt preserve as he is in the cows and the hogs and the horses."

I did get the thrill, as any person will get the thrill, of just unfolding the bible of conservation. What is the bible of conservation? Common sense and a knowledge of the outdoors. I could prove to any doubting Thomas that it was intended for us to fish for black bass with a hook and line and that it was intended for us to take the whitefish of Lake Erie with the seine. You only have to study the breeding habits and the deposit of eggs, the difference between the number of eggs, that a female whitefish will deposit, and a black bass, and you will see that the Almighty, piercing the infinite with an all-wise plan, had provided for the time when man would dip his nets into Lake Erie and the Great Lakes and take the fish by the thousand ton. Yet man by keeping in harmony with God's plan can keep as many whitefish in Lake Erie and the Great Lakes as there were when Columbus discovered America. Not so with the game fish. The game hog could destroy the game fish. They are not expected to be taken by seine, and so I might go on.

I am saying this because there is an economic side as well as a patriotic and a spiritual side to conservation. Why patriotic and spiritual? I was thrilled this morning at the statement that there had been no delinquency in children who loved the great outdoors. A survey has been made of a great State, hundreds of its boys, yes, I am sorry to say they run into the thousands, in its penal and reform institutions who have been sentenced there in

recent years, and not one boy from a 4–H club or a vocational school or a juvenile grange. Why? Not that these organizations in themselves were inherently so good, not alone that we opened the grange meeting with prayer, not that the open Bible was on the altar, not that the flag was in its place as required at every grange meeting—not that alone, but that the child was seeing the things that God has made in the great outdoors. Living in the country, interested in its problem, chasing rabbits and fighting bumblebees has kept many a boy out of the penitentiary and made a man out of him.

I do want in the closing moments that are mine to emphasize with all the ability at my command the necessity for cooperation of all the forces comprehended in this program, not only the sportsmen who live in towns, but the men on the farms. Recognize the common sense economic side of this program. Pay farmers for planting trees and not for plowing down cotton. Pay farmers for growing game and not for not growing some other crop. Build this conservation program and correct the great mistake we have made in America—despoiling field, forest, and stream.

Three hundred years ago the most beautiful forest, the most fertile soils, the most abundant game in all the world was ours and the onward march of our American civilization, glorious we call it sometimes, has left denuded hills and vanishing game.

Common sense will bring it back. We can do it first by a sound conservation program: Water, soil, forests; and second by a sound wildlife program, recognizing the wildlife on the farm and in the forest, in the Government preserves, by the breeding of game, by sound common-sense management.

Let's realize the challenge of this problem, and its patriotism. Take men from town, from civilization that man has made, out into the country to the things that God has made. Open the door and increase the lure, from smoke and city traffic and congestion and bustle out into the open country, into the forests, on the lakes and the streams, and when we do that we make for patriotism, we build better citizenship, we build for generations yet unborn. It has a spiritual side. Men that look up at the stars at night, men that look at one of the most beautiful things in all the world and the most majestic—not Washington's monument that I love to look at, not the Capitol that thrills me every time I see it—but a tree. Any man who can look at a sequoia or a great California western redwood towering up and looking down upon the centuries and not be a better man and not have the spiritual chords of his nature touched has something wrong with him. He is dwarfed or deformed somewhere.

So I say let's take a lesson from our mistakes. Let's organize, cooperate, and apply teamwork. Let's put some money into conservation of wildlife. Let's put some money into sound conservation programs that restore fertility, water, forest, and game, and then let us remember that if we make a home for wildlife we are blessing not only ourselves but generations yet unborn. If we fail, drought, shortage, dust storms, will hover over the land like the plagues of Egypt. If we succeed in a common-sense conservation wildlife program, making agriculture and the farmstead as the heart of the picture, we will not only bless ourselves but those that follow.

I thank you. [Applause.]

Chairman GREELEY. Mr. Taber, we thank you for your inspiring address. That is the way that cooperation lies. You helped us.

The next speaker is the one to whom I referred in opening, who is to make now the opening address of this session. He is a sportsman. So long as he was in the United States Senate we knew that we were listened to by a man who understood our language. We looked upon him as a brother sportsman. It is my very great pleasure to introduce Senator Harry Hawes. [Applause.]

ADDRESS BY HON. HARRY B. HAWES

Hon. HARRY B. HAWES. Mr. Chairman, I read over my speech that I expected to deliver today. My secretary told me that it would not last longer than 15 minutes, and last night I found it was a 40-minute speech, so I abandon it for printing and I am leaving it for you to take home if you think it is worth while.

I find that there are 12 other gentlemen to follow me this afternoon, so I will be brief and do as we used to when I was a Member of Congress, rise and say, "I ask unanimous consent to extend and revise my remarks", and then the next day you find a 2-hour speech delivered in 1 minute. [Laughter.]

It is a very great pleasure to be introduced by Mr. Greeley, the chairman of the oldest sportsmen's organization in America, the Campfire Club, and I was delighted to have the opportunity to hear the distinguished president of the great farm organization, because, my friends, of all the factors in wildlife the farmer occupies the most important position of all.

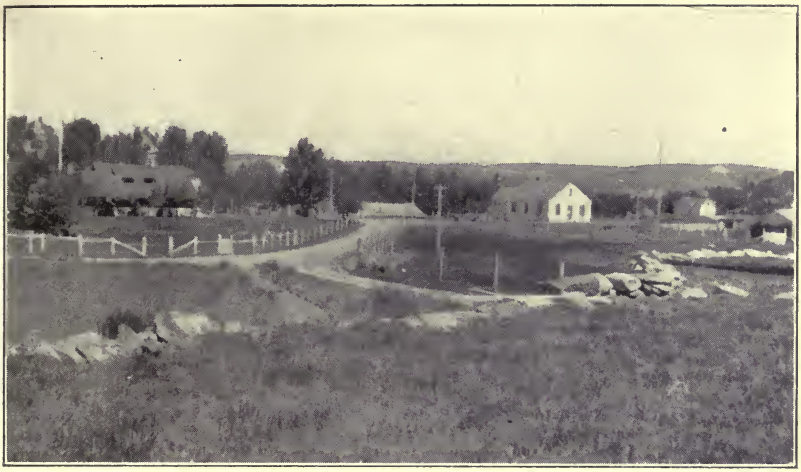
As I look around I see men who have been in this movement for many, many long years. It didn't require the call of the President to bring them to Washington because they have been meeting in various sections of the United States year after year, to my certain knowledge, for over 30 years.

I take the liberty of making a few suggestions. I do it because of some experience in serving on the game and fish committee of my State, in the legislature and in the Congress when we wrote that great upper Mississippi River bill which it was my pleasure to handle, 300 miles of river front to the headwaters of the Mississippi River, taking in the shore lines of four States, requiring legislative enactment from the Congress and then followed by legislative enactment of four great States.

It was my privilege to serve as a member of the Wildlife Committee of the United States Senate. One of the most enjoyable experiences of my life was addressing a Boston audience where they gave me the choice of my own subject and it was "Wildlife in the Senate and Wildlife Outside."

I had the pleasure of serving on the Migratory Bird Commission. and that bill that you know as the duck stamp bill is my baby. [Applause.]

Out of that bill has come experience and definite information which we never had before. Last year, in the session of the years 1934 and 1935, the duck stamp bill brought into the Treasury of the United States $635.000. This year—and mark the distinction—it has only brought in $356,000. Now, no man can shoot migratory birds



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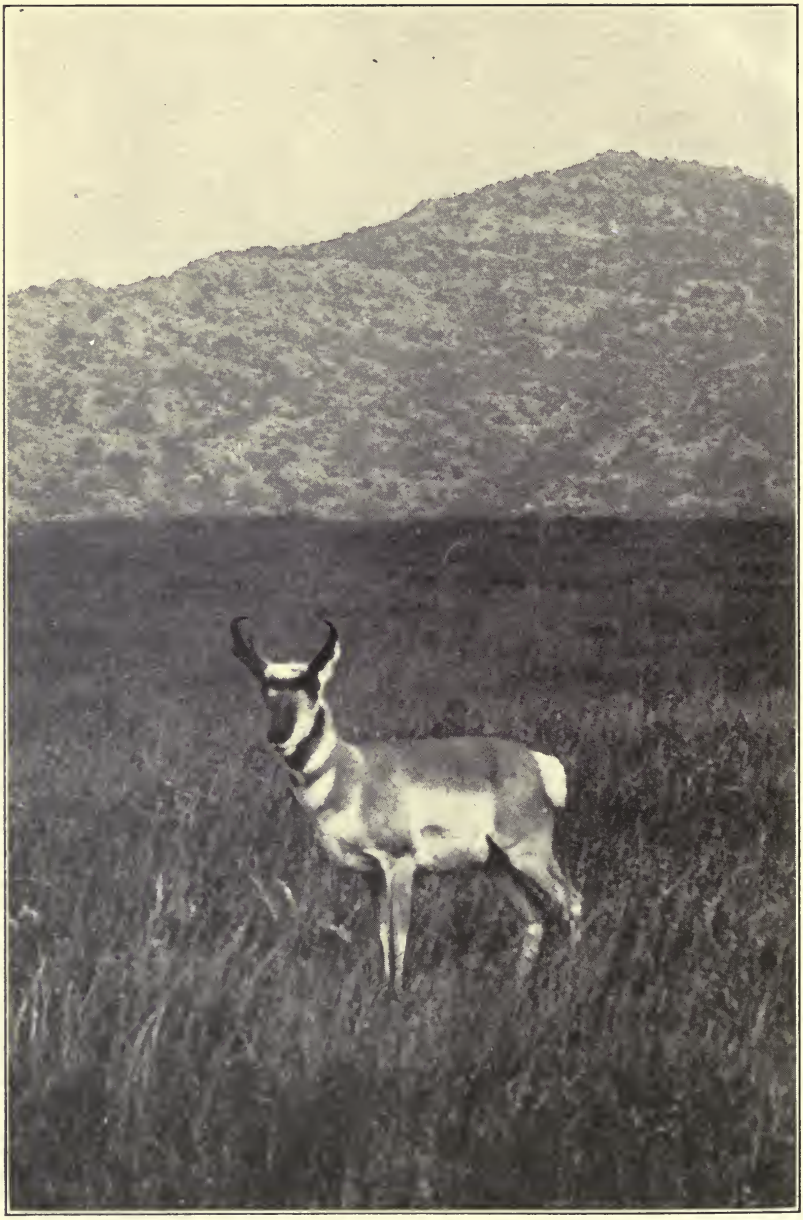
A, Headquarters of National Bison Range, Mont. (Biological Survey photo.)

B43026

B, Mountain sheep, or bighorns, grazing on a Rocky Mountain slope. (Biological Survey photo.)



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Antelope in a valley of the Wichita Mountains Wildlife Refuge, Okla. (Biological Survey photo.)

unless he has a duck stamp, so if we find a loss in 1 year of the sportsmen in America who shoot migratory birds of 279,000, that is a loss of 50 percent. Now, whether these 279,000 guns were put away, or whether the 279,000 guns were diverted from the field of migratory bird shooting and are now crowding the shooting of upland game birds, I cannot answer, but 50 percent of the men that shot migratory birds under Federal jurisdiction last year, either through a shortage of game or because of overregulation, did not fire a gun at the birds that are controlled by the Federal Government. That is a sad story any way you look at it.

It may be that it is a pleasant story for a few who believe that the sport of hunting and fishing is a barbarous thing.

My friends, the question of conservation undoubtedly falls into four distinct factors. The first is the Federal factor. The second is the State factor, the third is the farmer, and the fourth is the sportsman. When we look into the Federal factor we find—it is well to remember this—that Federal jurisdiction is limited absolutely to the control of game on Federal lands, and there is only one other jurisdiction which it has, and that is under the migratory bird treaty.

It is the first time in the history of our country that legislation has been written through a treaty.

We find, therefore, that that control is limited. It is only one-third or one-fourth of the problem of conservation. The rest of the problem belongs to the States. Uncle Sam can tell us what we can do on Federal lands; he can tell us what we may do in the matter of shooting migratory birds controlled by a treaty between Great Britain and the United States, and there Federal administration ceases.

There have been attempts, many of them, frequently, to extend Federal jurisdiction over State control, but it has met with failure on every occasion.

I do not believe that the States will ever voluntarily abandon their control over game under State jurisdiction, and there is only one way that Federal control can be extended, and that is by a change in our Constitution, which will require the approval of two-thirds of the Congress and three-fourths of the States, and we cannot do it by indirection.

I have been ill myself and not able to attend all the meetings of this convention, but I have tried to follow the matter in the newspapers.

I read where one gentleman suggested that we meet this matter by raising money from the Federal Government and dividing it in the form of subsidies to the States. How silly, how absurd that is. No committee in the Congress or Senate would report such a bill. No self-respecting State would submit to such a thing. That is the danger of the conservation movement. The danger is trying to do some impractical thing, some impossible thing, something that the constitution would not permit.

Now, there are many things that the Federal Government can do. For instance, we enacted a coordination bill that requires every department of the Government to consider conservation. It has not been enforced. So either by Executive order of the President

or by act of Congress a man could be given authority to compel obedience to that coordination bill, and I would recommend that that be done.

We can establish, and we ought to establish, a game farm in the vicinity of Washington where students could come and visitors to the Capital have the benefit of the experiments on that farm and take them home.

There are many things that we can still do under Federal jurisdiction, but let me say this: The last Chief of the Biological Survey had more money, he had more power, he had more land than any man that ever held that position.

There are things that we want from the Federal Government. For instance, one thing I think we certainly want is: The restoration of the advisory board which was established 25 years ago, brought from various sections of the United States for the purpose of discussing Federal regulations and game management. Last year, unfortunately, for the first time in a quarter of a century the advisory board was not brought to Washington and its opinions were secured by a written questionnaire. Now, it may be that 1 man's brain is better than 20 men's brains, but I don't believe it and I have never found such a man in my experience. [Applause.]

For illustration, we have four lines of flights of ducks. One condition prevails on the Pacific coast, another in the mountain region, another in the valley region, and another on the Atlantic coast, and certainly men coming from all of these regions, coming here in an advisory capacity, would help solve this problem. There may be a shortage of ducks along the line of flight, they may be plentiful in others, and there may be doubt about the supply in the fourth, and why shouldn't the Secretary of Agriculture and the Chief of the Biological Survey have the benefit of the advice and consultation of men coming from every region in the United States?

So I suggest the reappointment of the advisory commission with its power of suggestion, and that it not become a mere rubber stamp.

There were men and women on that commission who knew their districts and knew their subjects and certainly it should be helpful and it should be revived.

Turning to the State themes, we find there is 1,500,000,000 acres of land that are State and privately owned, and on every acre of it we could raise upland game birds and some fur-bearing animals. The Federal Government does not own and control one-third of that acreage, and it never can control that 1,500,000,000 acres unless we amend our Constitution.

What we need in the States are good game laws, and it was my privilege to act as chairman appointed some 2 or 3 years ago to write what was called a model game law for the administration of States, and it was a great pleasure to report that six States have adopted that plan. Other States have it under consideration. But the farmer in the State and the sportsman in the State can do nothing unless the laws of the State are properly written, so in the field of the State the model game law should be adopted.

Where do we find the money coming from to support conservation? Outside of the duck stamp bill and some appropriations from Federal aid, it comes from the licenses of 7,000,000 fishermen and 6,000,000 hunters and from no other source whatever.

So I say to you, my friends, it is the sportsman, the fisherman, the hunter, who pay the national bill for conservation, and they are the greatest friends of conservation. [Applause.]

I know of no State where, out of the general funds of the State, money is appropriated for this purpose, but I do know of States that take the money from the license paid by the sportsman and the fisherman and divert it to other purposes. In my mind that is a crime. [Applause.]

Then let's take the next factor, that is, the factor of the farmer. Who owns the land? The farmer. Where is game raised? It is raised on the farm.

When 1,500,000,000 acres are used that way, the farmer is the man who is to decide whether there will be game there or no game, and if he doesn't give a favorable decision the game will disappear, as it has been disappearing.

Men like Taber whose eloquent speech filled me with a very fine sense of gratitude, and especially when he went out of his way and talked about my friend, the black bass, understand that the farmer controls and that the farmer properly advised can make of game a valuable byproduct that can at least pay the taxes of his farm, or if he does not want to make a profit out of it, the farmer controls the latchstring of hospitality so that he can extend the courtesy of hunting to his friend who lives in the city.

I believe that while we look over all the factors, the National and the State and the farmer and the sportsman, I would say the farmer holds the key to conservation recovery. [Applause.]

One word about the sportsman. Look at this man (Greeley), president of the Camp Fire Club of America. Is he a murderer and a killer? Does he look like it? I know there are men and women who think hunting and fishing, fishing except with a barbless hook, is a cruel thing. They don't stop to think that every fish that is caught and every bird that is killed goes into supplying the food bill of the United States. There is no waste. You don't kill a bird and throw it away. You may catch a canary and put it in a cage and look at it, but you eat game; and it isn't the great elk and it isn't the grizzly bear, it is the lowly rabbit that furnishes the greatest game crop in America.

Now, what should Mr. Sportsman do? Mr. Sportsman, when he approaches the owner or the lessee of land, should feel that the farmer should not pay the entire bill. He should help; he should pay for the privilege of shooting or he should divide his bag with the farmer or he should reciprocate in some way the hospitality that the farmer gives.

Amongst sportsmen we have men who violate the law. I would say to the sportsman, when he finds a man who exceeds the bag limit, he should treat him just as we would a thief, a counterfeiter, a kidnaper, or an embezzler; he is an outlaw, and he should be reported. [Applause.]

If the sportsman understands the farmer and the farmer understands the sportsman the problem is solved. If anybody here has heard of any other way that the conservation bill is paid in 48 States from any other source than from the hunter and the fisherman, I should like to be challenged now.

Yet we go into meeting after meeting where the hunterman and the fisherman are assailed, only 13 million of them, because a few are lawless. These men who have inherited from their frontier ancestry a desire to fish and hunt are put upon the grill by some canary bird, some pet-shop friend, and by the friends of goldfish in a bowl.

Let up open the door for everyone who wants the return of the great outdoors, whether he wants to travel through the woods and the fields with a camera, whether he wants to camp and not shoot and fish, whether he is a sportsman or a nature lover who thinks so much of nature that he wants to protect the hawk that destroys the quail and the chicken and the wild turkey because the hawk is beautiful and the race of hawks might become extinct. Leave the door wide open for everybody to come in. Then let's unite, but in uniting understand that less than one-third of the problem belongs to the Federal Government, that at least three-fourths of it belongs to the States, that we can make no progress without the farmer, and that the sportsmen, hunters, and fishermen have paid the bill and are still paying the bill, and having understood that, let us all get together for a long pull and a hard pull and a pull all together for the benefit of the boys and girls that are coming after us for a better America, and in my honest judgment a more patriotic America.

I thank you. [Applause.]

(A copy of Senator Hawes' printed speech submitted for distribution follows:)

The Four Vital Factors of Wildlife Conservation

Address by Hon. Harry B. Hawes, delivered before the North American Wildlife Conference, February 6, 1936, 1:30 p. m.

The four vital factors in the wildlife conservation movement are the Federal factor, the State factor, the farmer factor, and the sportsman factor.

The conservation movement will not meet with practical success unless there is united effort and cooperation among these four vital elements. The first two involve the law machinery of the Nation and the 48 States; the last two are a matter of education and persuasion.

It is quite unnecessary to prove there is shortage in our wildlife of both fish and game. The proof is adequate. The evidence comes from every source.

In the Federal field the attempt to count migratory birds results in a mere guess. No one can count them on the breeding grounds, and certainly they cannot be counted in the air. They wheel and circle; they pass through at night at a speed of some 30 to 50 miles an hour.

The human eye and brain can only guess their numbers, but fortunately the duck stamp bill has given us something more substantial, more understandable, and more reliable than the mere guess.

And this information is so alarming, conclusive, and distressing that it demands your earnest, thoughtful consideration.

In the season of 1934–35 there were sold 635,344 Migratory Bird Hunting Stamps. It is reported that in the 1935–36 season up to date of December 21, 1935, only 356,000 duck stamps were sold.

This shows that in that period, nearly 280,000 sportsmen refrained from migratory bird shooting, a decrease of nearly 50 percent.

Whether these 280,000 have permanently abandoned the field because of shortage or because of an overregulation is problematical.

It may be reasonably assumed, however, that these 280,000 guns were not put aside permanently, but were used on upland game birds and animals. Whether they have permanently retired from the field of hunting or changed the field from migratory birds to crowd upland game birds has not been ascertained.

Conservationists are assembled today, as I understand it, for two definite purposes. The first is to prepare a definite program and devise means for carrying out a practical organization plan of saving both game and fish seed stock and for its replacement.

We have been proposing plans that are vague and uncertain. The time has come to shoot with a rifle at certain fixed targets, with certain definite objectives. Our danger arises from the fact that we must know where the bullet goes. Shooting in underbrush always carries with it a hazard. We should know what we want now before we go on our way.

The backbone of the movement must necessarily be the hunter and the fisherman who pay the State conservation bill. Intelligently organized, with definite, sensible objectives, the hunter and the fisherman can wield a greater influence than any single industry or occupation, or any other sport in the United States.

Game is not a mechanical thing. Taken into possession it is food of a delectable, healthy, and appetizing character. Reduced to possession it has an economic value in the life of the Nation running into many, many millions of dollars.

We cannot restore primitive conditions, but we believe that the factors inimical to the "great outdoors" can be counterbalanced by modern methods of game and fish replacement.

We may search for a Utopia but we will not find it. We may place an ideal so high that it could never be reached. We may propose plans so impracticable that they will destroy the attainable, the enforceable.

I trust you will pardon me if in what follows I appear to be too precise in my recommendations.

My long experience is my apology. For over 40 years the subject has been a hobby. I carried it into the legislature of my State, into the National House of Representatives, into the United States Senate, as a member of the Federal Migratory Bird Commission, and discussed it with hunters and fishermen in conventions throughout the United States and Canada and as a member of every national organization for conservation that has stood the test of time.

With this explanation of the definite recommendations I shall make, I give them to you for frank criticism, for approval or rejection, hoping they will be helpful, but with no thought that they are necessarily right and all-inclusive or that they are not subject to change or modification.

I plead only experience—some of it sad—with the hope that out of this great meeting will come an organized, harmonious, persistent effort to bring back Nature's heritage and hand it down to our boys and girls in replenished abundance.

THE FEDERAL FACTOR

The Federal Government owns approximately 400,000,000 acres of land, and it may control and direct the disposition of wildlife on this land through congressional action.

It has no control or direction with respect to the 1,500,000,000 acres of privately owned State land excepting that which is given by courtesy. The State legislatures have authority over this private property.

Efforts have been made to place all game under the control of the Federal Government. In each case these efforts have proved abortive; they have never made any advance. In my opinion they have no possible chance of success, for the States will never yield their local prerogatives, and they should not yield.

It is unthinkable that a Federal bureau should determine the local problem of each State. A man from Connecticut should not direct what should be done in Texas, nor the man who lives in Texas decide what should be done in North Dakota.

Population, characteristics, geographical conditions, habits, and environment will not permit this to be done.

It cannot be done under any circumstances without a new amendment to the Constitution, which can be defeated by a little over one-third of the Congress or one-fourth of the States.

There are two other forms of Federal direction. One is its powerful example set by national investigations, reports, and recommendations, its pamphlets, its educational services, and its cooperation with States.

The other form of direction comes from a treaty which might be withdrawn, and there is always the possibility (although I hope it will never happen) that zealots may bring its repeal by overregulation, just as there came a repeal of our prohibition amendment because it went too far and was therefore not susceptible of enforcement.

I refer to the Migratory Bird Treaty with Canada, for it is a strange and interesting historical fact that because of their migratory habits, and for that reason alone, certain birds and waterfowl have extended Federal jurisdiction and initiated a novel method of legislative enactment predicated upon a treaty concluded between two sovereign nations, the United States and Great Britain.

Had it not been for the migratory habit of these game birds, the powers of the Biological Survey would have been limited exclusively to the control of game on property owned by the United States.

We have a limitation on Federal authority, therefore, very clearly defined. Our problem seems to be to improve the machinery of this Federal control. How can it be done? First, and in part by—

A consolidation of all Federal conservation agencies under one control, that is, either under a new Department or under a Secretary reporting directly to the President, or through the designation by the President of some one official who shall have real authority to secure, by mandatory process, the active, practical cooperation of those departments covered by the Coordination Act.

Until a new consolidation of organic resources is perfected, and pending the creation of one conservation department, either by act of Congress or by request upon the President, a coordinator or director, with power to secure cooperation and effective administration for conservation should be created. This director or coordinator, in my opinion, should report directly to the President to avoid opposition and some natural jealousies from other departments.

We should demand action under the coordination bill, team work, and practical results.

What is everybody's business we find is nobody's business.

If departments will not act voluntarily as the law provides, an official selected by the President, and vested with authority, can force cooperation or at least publicly place where it belongs the responsibility for failure to cooperate.

The advisory board should be restored to full vigor and power. This board came into existence nearly a quarter of a century ago and has met each year for conference until the year 1935. Then, for the first time, it did not meet, the opinions of its members was obtained by written questionnaires. It should be restored and revitalized.

The President, acting through the Secretary of Agriculture, can select a representative board, having due regard for regional and geographical location, thus making it a most valuable agency in fact-collecting and for consultation and advice.

We must preserve a publicly known advisory board, or it will degenerate into an unofficial advisory board whose members are not responsible to the public; or, stated in another way, advisers known to the public may be replaced by unknown advisers with no official responsibility.

We should preserve a publicly known group for what may become private meetings of "Tailors of Tooley Street."

Its success or failure, however, hinges upon the absolute independence of thought and conviction of its members, on proper geographical representation, and upon freedom of opportunity to discuss, even to criticize, proposed regulations.

It would be useless to have a board unless these factors are recognized. To make of it a mere "rubber stamp", or a board whose opinions were not ascertained by personal exchange in meeting would be a mere waste of time and would be of little value.

Experts from the various departments should appear and answer questions and give the board the benefit of their scientific knowledge and investigation.

Added to this, members of the advisory board would bring facts from their respective sections. They could exchange opinions, and experts of the Government should frankly and freely discuss the results of their official observations.

As I have said, the members of the board should have complete independence of thought and conviction, and their selection in the future should be scrutinized with great care by the sportsmen's organizations of the United States.

Membership on the board would then be considered a very high honor and there would be attracted to it the best thought of the best conservationists in America.

Many spendid men and one fine woman have served on these boards in the past. They have given very unselfishly of their time and most of them have had the courage to express their convictions.

Its membership should be enlarged, and no new migratory-bird regulations should be promulgated until they have been presented for this board's consideration.

I recommend the board's restoration in enlarged form, with greater authority and independence, and that all efforts to make of it a "rubber stamp" be defeated.

No one man's mind is better than 20 men's minds. There may exist a man with a brain more commanding than all others, but we have not yet discovered such a man. Personally, I do not think he exists.

Members should be selected with regard to regional residence and experience. To concentrate its membership in one section and omit representation from other sections will defeat the object of securing a diversified personal contact experience so valuable and so necessary in the solution of a problem as diversified as that of Federal game control.

The name Bureau of Biological Survey does not carry with it an explanation of the duties of that agency. A change in its name has been recommended from time to time by Senate and House committees, by individual game organizations, and by outstanding conservationists.

It is no reflection upon the men who serve in that bureau that its name should be changed. In fact, it is a commendation of their growing influence and extended jurisdiction.

Biology is only a small though important part of the problem, but the designation "Biological Survey" does not now carry its true story to our people.

A national experimental station or game farm should be created in the vicinity of the National Capital for research and experimental purposes.

Here training could be given in game management, game breeding, and in the study and treatment of disease.

Students entering this institution should be selected from the various States. Their appointment should be suggested by Governors of States, land-grant colleges, 4–H clubs, and other interested organizations. The method of designating these students is not at the moment important.

If this farm or game college or experimental station could be established within 50 miles of Washington, it could be made of great educational advantage. In the first place, every patriotic citizen who can afford the trip visits Washington at some time in his life, and, in the second place, the Capital City is nearly always included in tours of college students.

The proximity of the school would afford an opportunity for the 96 Senators and 435 Congressmen, members of congressional committees, and executive officials to visit it and visualize the practical work of replacement under scientific methods.

It would be readily accessible to the scientific staffs of the Departments of Agriculture, Interior, and Commerce. It would undoubtedly stimulate renewed and popular interest in the subject of conservation. I believe that an Executive order could bring this about. Certainly it can be done by an act of Congress.

Regulations of the duck stamp bill should be strictly enforced. The bill provides an opportunity for securing, in new applications, vital statistics regarding the "kill" of the previous season. In fact, it is the only exact method of ascertaining what actually happens. A new license should not be issued until the applicant has given the exact number of migratory birds killed by him during the preceding year.

This would assure some degree of accuracy in the ascertainment of the annual "kill", stop the absurd guessing which is going on, and forestall some of the foolish estimates that cannot possibly be based upon accurate reports.

It would further assist in revealing the true situation as to regional abundance or scarcity of migratory birds.

The statement has been made frequently by intelligent observers that in the four established lanes of migratory bird flights there are in some sections an abundance, in others a shortage, and in still others a dangerous shortage.

A record of the "kill" in the preceding year would do much to definitely establish the shortage or the supply.

I have watched the progress of this bill with keen interest because it is what I might call "my baby", and I would like not only to see it become a source of income but also a method of securing exact knowledge in replacement of guess and conjecture.

Senate and House committees on wildlife conservation have performed invaluable work, probably the best that has been given to our people, because their recommendations have been practical and have been written into law.

We may express the hope that both the special Senate and House committees shall be made permanent standing committees. The subject is sufficiently large, from the point of view of economics and public interest, to justify this action.

I make these few recommendations because they are easily effectuated if united effort is put behind them.

They represent by no means all that can be done, nor all that should be done, but they are achievements which are within sight in perfecting Federal control.

THE STATE FACTOR

The State factor represents by far the largest portion of the problem. The Federal Government may point the way and give assistance through scientific research, but a coordination of the whole plan of conservation depends upon the intelligent activity of the States.

This brings a direct challenge to each governor, to each legislature, and each unofficial organization.

While the total of Federal acreage is approximately 400,000,000, the State acreage is approximately 1,500,000,000. It is upon this vast State acreage that we find most of our upland game.

First in food and hunting value is the lowly rabbit—the young hunter's delight, and a choice morsel for the farmer's table—whose skin has a great fur value. Then come the deer, the quail, the grouse, the pheasant, the wild turkey, and a number of other birds and animals, all upland game, under State jurisdiction.

Game belongs to the States or, when on Federal property, to the Federal Government.

The State has the right to regulate the bag limits and seasons for shooting, and to impose these regulations in the exercise of its police power or what might be termed community interest. And these regulations are binding on the landowner or lessee of lands.

The first requisite, therefore, is proper administrative laws for each of the 48 States. Some States have excellent laws which require no revision. Many more certainly require a change in the manner of administration, and some are unquestionably bad.

Some 2 years ago, a committee was organized to prepare a model State law for administrative purposes, and it is a pleasant thing to record that the legislatures of six States adopted, in whole or in part, our plan of administration which is simple but effective.

My recommendations in the S ate field are—

Adopt the proposed model State administrative law. Urge its passage upon all candidates for governor and all candidates for legislatures. Some variation of the act may be required because of local conditions, but the fundamentals are sound, and it follows the thought of uniformity in State legislation now urged for all subjects.

Remove politics from game and fish administration. Hunters and fishermen are neither Republicans nor Democrats; they are primarily sportsmen, and can be persuaded to disregard partisan lines and unite in removing game and fish management from political uses in both primaries and elections.

Establish new State game parks and sanctuaries. An increased acreage is necessary. Purchases can be made now while the land is cheap and submarginal land is on the market. One experimental station in each State is necessary; more than one are desirable.

State universities, colleges, and public schools should promote the study of game and fish conservation. It greatly interests the student. They like the subject. They are what might be called the seed crop for future conservationists. What they require is not alone academic study but stimulation, assistance, and applause for work well done.

Financial assistance is necessary for instruction in land-grant colleges, in the 4–H clubs. The subject should be brought home also to the Boy Scout and the Girl Scout, the junior chambers of commerce, the chambers of com-

merce, the farm organizations, the American Legion, and the Federation of Women's Clubs.

It can be made a topic of interesting and entertaining discussion for Kiwanis Clubs, Rotary Clubs, and kindred organizations. I cannot mention all.

State funds for the support of conservation, which come from the hunter and the fishermen, should not be diverted and used for any other purpose than conservation. Any attempt to divert their use for other purposes should be vigorously opposed.

The State program should be short, understandable, and not difficult to explain. We should stress its scenic and health advantages and by all means avoid the impractical in both legislation and administration.

THE FARMER FACTOR

The farmer and the landowner hold the key to the restoration of game. Without an understanding between the sportsman and the farmer, preservation and restoration cannot succeed.

The farmer must be convinced, and it can be done, that game is a valuable byproduct of the farm, and the sportsman must not expect the farmer to contribute to his pleasure without compensation.

The farmer has been put to expense and trouble to acquire what he has, and the sportsman must expect to bear his part of the cost.

The farmer lives on the land. On his acreage there is or could be ample food and cover for upland game birds and many of our smaller animals.

He controls the latchstring to the hunting field, and his importance in the picture of wildlife restoration must not and cannot be overlooked.

No plan for the restoration of wildlife can be successful without the inclusion of the farmer as the first vital factor, and when this thought finally impresses the sportsman, the greatest hurdle in the wildlife restoration program will have been passed.

A new relationship must be established between the sportsman and the farmer which will carry with it mutual respect and cooperation characteristic of any other effective partnership.

When he is shown how, the farmer can make enough from game to at least pay his taxes. This has been done in many of the Southern States where shooting privileges are leased.

I am convinced that the future of game restoration depends upon the attitude of the farmer or landowner, who, with the sportsman, will bring about constructive legislation in game management for this purpose.

THE SPORTSMAN FACTOR

Sportsmen, hunters, and fishermen are the chief support of real wildlife conservation.

To those splendid men and women who know the law and observe it, advice and suggestions would be a gratuity.

Game, fish, and fowl are valuable as foods. There is no waste in the killing of these so long as the seed stock is preserved and replenished.

A man with a hunting license and a gun should not be permitted to cheat. Every time a hunter or a fisherman exceeds the bag limit he steals from his fellow sportsman; he does a dishonorable thing.

When the limit is 10 birds and he takes 15, he steals 5 birds from his fellow sportsman; he violates the law and plays the game unfairly.

Other sportsmen should not tolerate him. A license should be considered a decoration, something worthy of pride. It should not be a device for evading or violating the law.

No man should attempt to hunt until he is thoroughly familiar with his gun and has practiced with it.

I am convinced that cripples constitute a serious loss in game life, and I might add in fish life, such as the careless handling of undersized fish in returning them to the water.

Accuracy in shooting and the possession of a retriever dog will lessen the heavy toll of cripples.

To illustrate: We will suppose that the limitation is 10 birds, but in securing this limit the hunter wounded 5 others which escape only to die later. This in effect has raised the hunter's limit to 15 birds instead of 10, even though the 5 which were crippled are lost to him.

He has done more than violate the law of ethics in hunting; he has not only killed 50 percent more than the bag limit but he has been guilty of a serious actual waste of wildlife.

A real sportsman obeys Federal and State laws. If he does not approve regulations, or finds them too rigid or, like the prohibition law, he considers them too extreme, he may exercise his American prerogative by asking for a change, but as long as the laws are on the statute books, they must be observed.

By setting an example, the sportsman can do much, by his own conduct.

If he will give just a little time to the new hunters, the boys that are coming along, and instill in them a true spirit of sportsmanship, the work will be more than half done.

Sportsmen will find that State legislators, Congressmen, and United States Senators are as a rule good fellows, and if he will secure contact with them, or write to them giving his point of view, I am sure his letters will be acceptable and helpful.

For the sportsmen I would recommend the following:

1. Assist the farmer, cooperate with him, by advice and practical assistance in the preservation and restoration of game.

2. Join the most representative and practical sportsman's organization in his immediate vicinity, and be sure that this local organization has a contact with a national organization.

3. Become acquainted with the game warden. Do not hesitate to report violations of the law. It is not an unethical, despicable thing to do; be brave about it. You would report a thief, a counterfeiter, or an embezzler. Why should a game "outlaw" not be reported in the same way that other violators are reported? It is the right thing to do.

4. Appeal directly to the State representative and State senator from your district. Tell them of the necessity of a model State administrative law. Express an interest. Write a letter. It will be appreciated.

5. Communicate with the Governor of your State or the candidate for Governor. Let him know that you are watching and are interested. Do not suggest the impossible. Demand a few sensible things.

CONCLUDING

Concluding, it will be noted that I have omitted reference to the important subject of pollution, and have not had an opportunity to refer at length to game fish and the fisherman. It has been a disappointment to me that I have had to avoid these important subjects, but 15 minutes is too short a time in which to cover even one of them.

We must preserve our game fish, we must battle with the fish "hog" as we do with the game "hog." We must instill sportsmanship and respect for law.

We all know that 7,000,000 fishermen, who pay for conservation in their respective States, are nearly all hunters as well. Their problems are much the same.

State legislation and administrative laws are under one head, so that in discussing game and in making suggestions, all that I have said of hunters applies with equal force to the fisherman.

The division of powers between the Federal and State Governments is relatively the same except that navigable streams are under the jurisdiction of the Federal Government.

Fishermen and hunters have the power; they ought to have the incentive. If they raise their voices we can bring back or restore that wildlife so essential to the health, the pleasure and, I believe, fine patriotism for our citizens.

"A long pull, a strong pull, and a pull all together", should be our slogan for restoration of wildlife.

Chairman GREELEY. We are now ready to take up the next part of the program, "Management by Public Agencies."

The first speaker is known to most of you; we have followed his course in the past, and his activities in the conservation of wildlife, with keen interest. Mr. Elliott S. Barker. [Applause.]

Remarks of Mr. Elliott S. Barker

Mr. Elliott S. Barker (Santa Fe, N. Mex.). Mr. Chairman, ladies and gentlemen, the subject that was assigned to me before coming here to Washington was "Wildlife Management by State Agencies." However, I note that on the program it is given as "Wildlife Management by Public Agencies", so if my paper does not exactly conform to what might be indicated by the subject given, you will understand the reason. It so nearly conforms with what I would have written under that topic that I think there is no need for me to make any change.

There seem to be six major questions which must be discussed in presenting any sort of picture of the States' wildlife regulation and management problems. Each one of these six topics, branching out as they do into numerous subheadings, would require fully 15 minutes for thorough presentation. Therefore, only the briefest sort of discussion can be given at this time, and I shall endeavor to touch only upon the more important aspects.

We shall deal with the present and the future; the past is gone and concerns us only insofar as we can profit by the lessons it has taught.

Jurisdictional questions must be touched upon first of all.

Migratory birds, which by virtue of the Migratory Bird Treaty with Great Britain, have been made wards of the Federal Government and are subject to control by it. Except for migratory birds it is the commonly accepted theory, recognized for centuries, that the title to fish and game within the boundaries of a State is vested in that State, held in trust for the people thereof. The courts of last resort have universally upheld this theory wherever the question has had judicial cognizance. The Supreme Court of the United States has upheld these decisions of the lower courts uniformly in the many appeals that have been taken. Therefore, it is obvious that nothing less than a constitutional amendment could give the Federal Government control of State wildlife.

That is the authority for and the foundation upon which the States base their rights and perogatives in regulation and management of the wildlife within their boundaries. The promulgation by a Federal Department of regulations designed to set aside or usurp at will this authority must be resisted just as vigorously as would be the efforts of a private land owner to control the seasons, bag limits, and license fees for wildlife found upon his private land.

Clothed with commonly accepted, legal and constitutional authority, the State legislature must then provide the necessary laws for management and regulation of wildlife. This brings us to the second phase of our subject, namely, State laws for wildlife regulation and management.

Every State, of course, should have adequate game and fish laws, providing a safe and flexible system for the protection, development, and use of wildlife for recreational purposes.

The majority of the States now operate under nonsalaried game or conservation commissions as the policy-making body. These commissions of from three to seven members should be nonpolitical with

overlapping terms, to insure a continuity of effort. To the game commission, or the game commissioner, or corresponding official, should be delegated full regulatory powers over the wildlife of the State. These powers must be sufficient to permit the harvesting of game according to the supply in different localities, afford special protection where required, permit taking of surplus game of either sex, and limit the kill wherever necessary.

The personnel of the department should be selected by the executive head. The commission, or head of the department, should have general control over the collection and disbursement of all moneys belonging to the game or conservation departments' funds. The sportsmen should be guaranteed by law that the money paid in for hunting and fishing licenses shall not be transferred to any other fund.

License fees for nonresidents must, of necessity, be greater than the rates for residents, but all license fees should be commensurate with the privileges that are granted, and sufficient to produce a reasonable revenue. The principle of reciprocal nonresident license fees between States is not sound, for the citizens of a State having little to offer and consequently low license fees would thus be enabled to enjoy greater privileges in another State at a minimum fee. Often where license revenue is insufficient the funds should rightfully be supplemented by legislative appropriations from the general fund.

It is essential that penalties provided by the legislature for game and fish law violations be adequate and commensurate with the gravity of the crime. Furthermore, provision should be made for recovery of specific amounts as civil damages for illegal killings of game. New Mexico statutes provide for the recovery of the following minimum sums for each animal specified: Elk, $200; deer, $50; antelope, $100; mountain sheep, $200; mountain goat, $200; beaver, $50; for each bird, $10; and for each fish, $1. That gives an idea of the actual value that the Legislature of New Mexico has placed upon the game animals in that State.

Good roads and modern transportation facilities have given the unscrupulous game law violator added opportunity to kill game and escape undetected and unpunished. In New Mexico we have recently secured the passage of a measure which authorizes, through due process of law, the seizure, confiscation, and sale of cars, airplanes, trucks, or other means of conveyance used in illegal transportation of game. I commend this law to every State as a means to demotorize violators. [Applause.]

In many instances game and fish laws have been built up piecemeal over a long period of years and could be greatly simplified by the passage of a single code to replace all existing statutes. The heart of game laws adequate to meet modern conditions lies in the delegation to State game commissions or similar boards or officials full regulatory powers over wildlife, and most States now have such commission laws.

Possessed of proper and adequate laws relating to wildlife, their execution is next in line, so let us speak briefly of the personnel set-up.

The efficient operation of any State game department depends upon the selection of the personnel from the standpoint of qualification rather than for political reasons. This is more and more

being recognized all the time, and much progress is being made. The complete solution is not necessarily civil service, for the civil-service system often serves to perpetuate inefficiency.

The various branches of most game and fish departments will be about as follows: Executive, law enforcement, fish cultural, predator control, game studies and investigations, game propagation, and education. All of these branches, to function properly, need men of high character, qualified for their respective positions. Education and scientific training is a fine thing, but it cannot take the place of practical knowledge and experience and good common sense. [Applause.]

Jurisdictional authority, adequate game laws, the right kind of personnel, and the necessary funds are the equipment needed to begin actual wildlife management by any agency, so we come next to the first step in game management activities, which is an inventory of wildlife resources.

Mighty little effective work can be done for wildlife unless we know pretty definitely what we have to work with and what the limiting factors are. Therefore, a complete inventory of all wildlife resources in the State is the initial step in game management. Naturally when one deals with numbers of wild birds and animals, figures must be more or less general approximations. Yet a census can be made accurate enough to be indicative of the relative abundance or scarcity of the various species involved, and their distribution can be definitely determined.

The inventory should not stop with a census of wildlife species. Indeed, while that is necessary, it is of minor importance compared with the inventory of potential resources. This requires accurate mapping of the entire State for each species of wildlife to show, first, the original range where each species was found; second, the present occupied range; third, potential or prospective range now suitable for restoration of the species of game involved; and, fourth, the potential game range which itself must be restored before restoration of wildlife is possible. Suitable locations for State game refuges may be determined as a part of this work.

The object of this whole resource inventory is to find out the facts, regardless of how unpleasant they may be to face, as to what wildlife we have left, what has been lost of wildlife and habitat, what forces of destruction are operative, what and where restoration of both habitat and wildlife is needed and possible and what is feasible. While habitat will be discussed later, right here I want to make it plain that the restoration and maintenance of habitat is the all-important feature in game management.

In New Mexico such a wildlife survey was made 10 years ago by Mr. J. Stokley Ligon, game specialist of the department of game and fish. Progress has been made in spite of many adverse conditions and local reverses. Elk, completely exterminated about 1900, have been restored, so that we now have about 5,000 animals. We have restored our wild turkeys to a dozen different mountain units where they had all been killed out. We have reestablished scaled quail in many areas and gotten them started in some new places. Gambel quail have been established in many entirely new localities. Pheasants have been introduced successfully in the larger irrigated valleys. Adult prairie chickens have been trapped and transplanted

to a half dozen new areas. However, the 1934 drought seriously set back upland game birds throughout the State.

Sage hens have been reintroduced to several units of their former range, the birds having been procured from the Wyoming Game Department in exchange for some of our native species. We have brought in mountain sheep from Canada to endeavor to get a new start of the species in our high mountains. We have established and maintain over 150 State game refuges, few of which, however, are owned by the Department. We have had to go into predator control extensively. I could continue to tell of what we are doing, but I must pass on to more important features.

As wildlife problems become more and more important we must go a step further in making management plans. All of the Western States and many others are entirely too large and possess such a diversity of conditions that a State-wide management plan is not practicable. The States must be divided into natural game management units. Arbitrary boundaries, such as county lines, national forest boundaries, survey lines, and so forth, are not suitable. Natural units with practical boundaries are necessary. This may mean from a half dozen to 30 or 40 management units in each State. For each unit a complete inventory of existing and potential resources is necessary as a basis of the management plan. Habitat requirements are of prime importance, and a definite determination of the actual needs of each unit to make it properly productive of wildlife must be made. The plan, of course, should provide for harvesting of the game on each unit in accordance with the annual yield available.

We have now started out on this work in New Mexico, beginning with the grazing districts established on the public domain under the Taylor Grazing Act. This is in accordance with the special rules provided for New Mexico by the Secretary of the Interior in accordance with recommendations made by all interested agencies in our State. Much data and knowledge possessed by the Department are available for use in completing this work. Other agencies such as the Forest Service have much valuable data also.

Maintenance of suitable wildlife habitat must be given a prominent place in this discussion.

Wildlife, including birds of the air, fish of the waters, as well as big game in forests and plains, have suffered directly or indirectly more through destruction of habitat and primitive environmental conditions than from any other cause. When habitat is destroyed, wildlife is exposed to natural enemies, made more easily killed by hunters, and is faced with food shortage, a combination of odds too great to be withstood.

Restoration and maintenance of suitable habitat and environmental conditions for wildlife is the States' biggest problem in game management. The States own and control the game but not much of the land upon which it must live. Land in the West is mainly comprised of small farms, large ranches, State institutional land, railroad and other land grants, national forests, Indian reservations, national parks, and the public domain. Upon some areas in each class there is suitable wildlife habitat and we may expect that it will be maintained. Likewise in each ownership there is much land where wildlife habitat has been destroyed or is far below normal.

It is a real job to coordinate all economic uses and have even a little feed and cover left over for wildlife.

Many private individuals among farmers and ranchers, and especially in our State the stockmen, are the very best friends of game, protect it loyally and want it on their lands. At the same time they often so heavily use their forage resources that little is left for game to eat. This same situation is equally true on much of the national forest land, where a large percent of the big game, except antelope, range is found. The difficulties of preserving important browse forage plants of the border or fringe type, where mountains verge into foothills and prairies are worthy of special attention by those charged with forest administration.

Rough brush ranges in the higher areas which are not economically suited to grazing of livestock are likewise too heavily used by stock and the game habitat is being destroyed. High timber line areas often are grazed to the rass roots by sheep in summer to the detriment of native species of wildlife. On one forest in our State there are hundreds of thousands of acres where brush forage, such as live oak, mountain mahogany, and cyanothus, upon which deer are dependent for food and cover, is being rapidly killed out by excessive use. Except in a very few local areas wildlife is not responsible for the over use. Drought of course is a contributing factor by causing heavier use of browse plants and lessening their vitality and power of resistance to adverse climatic conditions.

All are familiar with the history of the public domain. Through lack of any sort of regulation by the Federal Government much of its surface resources have been destroyed, and along with it much intermingled State lands have suffered also. On the Indian lands not only has there been destruction of habitat, but for the most part complete annihilation of big game has been accomplished as a result of the Bureau of Indian Affairs defending the so-called inherent right of the Indians to hunt and fish unrestricted. There can be little satisfaction in cherishing this so-called right now that there is nothing left to hunt. Both game and habitat must be restored so that wildlife may again contribute to the Indians, economic welfare.

We hope there is an effective awakening of wildlife conservation sentiment for Indian lands. We believe that the Taylor Grazing Act has great possibilities for restoration of surface resources on 80,000,000 acres of public domain lands. We feel that the national forests can be of greatest benefit to present and future generations through restoration and maintenance of wildlife habitat, protection of watersheds, stopping erosion, and restoring streams to normal conditions. Private grazing interests are going to be forced by economic conditions to produce better but fewer livestock, which in turn should result in improvement of range conditions for both livestock and wildlife. Again I repeat, the greatest problem we have is maintenance of wildlife habitat.

It is obvious, therefore, that when big game forage is over used or scarce, management plans must provide for the maximum annual yield from a given number of brood stock. Hence, if the excessive annual contribution of game to predators can be curtailed, we may either increase proportionately the number available for sportsmen, or maintain the present yield with a fraction of the present brood

stock. In short, predators must be controlled to insure the maximum production of game animals with the forage available.

The States must depend for maintenance of habitat upon voluntary action by landowners or upon such cooperative agreements between the game departments and the landowners, whether public or private, as can be worked out.

Cooperative relations of all interested agencies are of great importance. All game management plans should provide that private landowners must be encouraged by game departments and sportsmen's organizations to recognize the value and economic advantages in producing more game. Sportsmen must accept the farmer and the rancher as a partner in the business of wildlife production. We must respect the landowner's rights and must learn to be more considerate of his interests. Not until then can we expect the average landowner to become a warm friend to the sportsmen's interests. Predator and rodent control are problems in which the landowner and the game departments are mutually interested. Cooperative work in these lines will be conducive to better relations where valuable wildlife species are concerned.

The official agencies chiefly concerned in wildlife management in the West are the State game departments, the Biological Survey, the United States Bureau of Fisheries and, as custodians of public lands, the United States Forest Service and the Division of Grazing, Department of the Interior. The Soil Conservation Service probably has a great future in this field also, but it is too new to be brought into this discussion.

Each agency has a definite place and function. These should not interfere with each other, but their respective responsibilities should dovetail together to complete the whole scheme.

May I conclude this discussion by venturing a broad definition of the functions and obligations of each agency insofar as wildlife management in the States is concerned:

First, the duty of the United States Biological Survey is to make scientific investigations, wildlife studies and surveys, food habit and disease studies, and so forth; to assist in predator and rodent control; to provide and execute management plans for restoration and protection of migratory birds; to establish seasons and bag limits for migratory birds after consultation with State wildlife agencies; to provide other agencies with scientific information and advice.

Second, the province of the Bureau of Fisheries is to provide technical and scientific advice to all other agencies as to proper species of fish for stocking public waters; advice as to fish food in public waters, with special attention to its increase where deficient; make studies of fish diseases, both in hatcheries and public waters; to make stream surveys and other investigations. Also, to assist State game commissions in the stocking of streams by furnishing spawn, fry, and fingerlings from Federal hatcheries where needed to supplement State operations.

Third, the obligation of the United States Forest Service and the Division of Grazing on the respective lands administered by each is to provide suitable environment for fish in streams and lakes. This is to be accomplished by adequate watershed and canyon bottom protection insuring natural conditions, preventing floods and

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Antelope on Hart Mountain Game Range, Oreg. (Biological Survey photo.)

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Buffalo in Wichita Mountains Wildlife Refuge, Okla. (Forest Service photo.)

producing shade and cover; to make structural stream improvements necessary to restore natural conditions that have been impaired through the years by excessive commercialization of public resources. To restore and maintain environmental conditions requisite for normal game habitat; to protect all forage resources against injury and loss through excessive use; to appropriately correlate in the public interest the use of public land by livestock and wildlife; to assist State agencies in the preparation and execution of their wildlife management plans for public lands. Also, to perpetuate for all time actual primitive conditions on a reasonable number of well distributed outstanding areas.

Fourth, the State game departments' responsibility is to provide fish planting budgets as to numbers and species of fish to be planted in all public waters; to hatch, rear, and plant fish in accordance with the budget; to make and execute game management plans for protection, propagation, restoration, and regulation of nonmigratory game birds, game animals, and game fish; to establish seasons, bag limits, size limits, and so forth; to sell licenses to hunt and fish, make and enforce rules and regulations for management of wildlife, with the purpose of maintaining a sustained annual yield compatible with available food supply and the demand for game; to accept constructive cooperation of the other agencies interested, to the end that maximum benefits will accrue to the public.

When these Federal and State agencies meet their respective obligations and harmonize their efforts, a new day will have dawned for wildlife.

I thank you. [Applause.]

Chairman GREELEY. That is one of the papers that I hope will be printed. It will be of great value, and comprehensive study of the problem will interest more than are here present.

When we succeeded in getting Seth Gordon to come over to New York, taking him away from the Izaak Walton League and from the State of Pennsylvania, we were very happy. Now, he goes back to Pennsylvania, and I beg to express to Pennsylvania, through our next speaker, Maj. Nicholas Biddle, chairman of the Pennsylvania Game Commission.

REMARKS OF MAJ. NICHOLAS BIDDLE

Maj. NICHOLAS BIDDLE. Mr. Chairman, ladies, and gentlemen, Seth Gordon, our secretary, seems to be doing a great deal of the work at this conference, and I appreciate your remarks about him.

I also appreciate the remarks of Mr. Taber and of Senator Hawes in regard to Pennsylvania. I noted that Mr. Taber referred to Pennsylvania as the State of rotten politics, and he said, "No matter which party was in power, it was just as rotten." I can merely add that in the last 40 years preceding 1935 we have had only one party in power, and it wasn't the Democratic Party!

The reference of Senator Hawes to the 4,000,000 rabbits killed must make you realize what an army of gunners we have in Pennsylvania.

Some of the previous speakers have said they were going to be brief, but I don't think they have entirely adhered to that statement.

I have my watch in view and am thinking of the nine men that are scheduled to speak after me, so I am going to be brief. When I say "brief", I mean I am going to speak within my allotted time.

A great many of the problems in Pennsylvania, and I am thinking of specific problems now, are the same as those in the other Eastern States, and therefore I think they are interesting to many of the people here today. They are also similar, in some respects, to the problems of the last speaker. Although I never saw his paper until he read it, you might think from some of the things that are in mine that I had copied part of it.

In order that my views on this important subject may be more fully understood, permit me to review briefly the methods we have pursued in Pennsylvania and some of the problems which now confront us.

Our game commission began its work in 1896. We have always adhered to a consistent policy, notwithstanding numerous changes in the personnel of the Board. Slight variations were made from time to time to meet altered conditions, but the basic policies laid down 40 years ago still stand.

These four decades readily divide themselves into two major periods. The first 20 years, with meager funds appropriated by the legislature, were devoted to laying the groundwork, to planning the program. The second 20 years were devoted to the development and execution of the plan.

Up to the end of the first period, the maximum sum available in any year was $49,000. Then we began to expend the increased funds, made available through the hunter's license law, and our program was expanded and developed accordingly. While in 1915 we began working on a basis of approximately $250,000, today we are spending over $1,250,000 annually in an effort to supply game for an army of nearly 600,000 resident hunters while 5,000 to 6,000 of our neighbors who come to enjoy the sport with us. From this, you will note that Pennsylvania has about one-tenth of the licensed hunters in the United States.

I might add that our fish commission also is expending in the neighborhood of $450,000 annually to supply the wants of the anglers, or together we are spending almost $1,750,000 every year in an effort to maintain good hunting and fishing in Pennsylvania.

Now, as to present problems, and how we are tackling them. Approximately half of our 45,000 square miles are covered with second growth forests, the balance being devoted to farms and small woodlands. We early developed a very rigid set of game laws, with short seasons and small bags. Next we launched an extensive program of forest-game management through the development of a series of game refuges. Later we started to buy lands solely for game purposes.

Today, on our more than 1,500,000 acres of State forests, 500,000 acres of State game lands, and almost 750,000 acres of national forests, we are maintaining 192 game refuges, varying in size from 100 acres up to 3,000 acres, containing an aggregate area of 132,804 acres. All of the balance of this large area is open to public hunting.

We have developed four game farms, upon which we raise ring-neck pheasants, bob-white quail, wild turkeys, and other game in large quantities for stocking purposes. We also have imported and

liberated many thousands of rabbits, bob-white quail, Hungarian partridges, pheasants, and several thousand deer. Extensive winter game feeding programs also are an important feature of our work, and during the past 20 years we have expended over $2,000,000 in the control of predators.

Due to very favorable conditions at the beginning of our expansion program, with most of our forest lands recently cut over, which furnished ideal feeding and breeding grounds, we made unusual progress, especially with our forest game.

But conditions have changed very radically during the past 20 years. An efficient forest-fire protection system has been in effect for many years. As a result of this protection, we now have many areas where the second growth timber is becoming large, thereby shading out the undergrowth so essential as browse for deer and as cover and food for the small game which inhabits our forests. We failed to keep our deer herds under reasonable control and now it is feared we have reached the "upper ceiling" in deer abundance, until such time as extensive lumbering operations again become the vogue. This also has adversely affected our grouse, snowshoe rabbits, and other terrestrial forest species, which thrive best on newly cut over forest and brush lands.

We sought to alleviate the present situation by buying thousands of acres primarily for game lands, upon which we might manage cover conditions solely in the interest of the game crop, and which would also assure ample public hunting grounds.

The problem on our forest lands now is to set up and execute a comprehensive plan of treatment or management in order to restore suitable food and cover conditions. To date it has not been possible to conduct wholesale thinning and patch-cutting operations necessary to open up the crown canopies of the trees on these areas so as to encourage sprout growth to furnish browse for deer and berry and nut-bearing shrubs to supply food for small-game species. Consequently, we now plan to cut heavily, both on our 500,000 acres of State game lands and elsewhere, if satisfactory arrangements can be made, so as to have 1-acre patches distributed fairly evenly throughout the forest where underbrush and other open-cover growth has been shaded out.

Just what percentage of any given area should be so treated to provide the most favorable game habitat we do not know, and apparently no one else has determined it. As a start, we contemplate cutting about 5 acres out of every hundred, evenly distributed over a given unit, then continue these cuttings from year to year on a definite rotation basis.

Old roads and numerous trails, not automobile highways, are also being cut through our State game lands to provide fire protection. These openings will result in an increased supply of game food. The present C. C. C. program, while condemned in many quarters, has been helpful to our game in many of Pennsylvania's forests. Its only doubtful feature has been the construction of improved roads into our few remaining wilderness areas, which will make them, in our opinion, too readily accessible.

Planting food and cover patches on abandoned farm lands has been conducted on an experimental basis, with reasonably satisfactory results. However, efforts to raise food-bearing and cover shrubs and

trees in heavily populated deer territory, have, in many instances, been almost a total failure. Deer have frequently eaten such plantings, including young forest-tree seedlings, almost as rapidly as they were set out.

I am convinced, nevertheless, that our present forest-game problems can be solved by State agencies, especially if we control our deer herds to avoid overstocking, and that a proper balance between the game supply and available food and cover can be restored by management.

And now for our more serious problem, which is: What can the State do to help improve the wildlife habitat on privately owned farm lands in regions far remote from our extensive forest holdings?

In Pennsylvania, as in many other densely populated agricultural States, there is a noticeable increase in the "no hunting" signs and in some sections there is practically no unposted land. Our landowners, notwithstanding efforts to induce them to vary their intensive farming practices in the interest of game and other wildlife, insist upon manicuring their farms and removing all wildlife cover and food. Restocking such areas annually is of little avail, especially so long as the farmers insist upon destroying wildlife habitat faster than it can possibly be restored.

To date, even our efforts to induce Pennsylvania's farmers to use flushing devices during their harvesting operations have met with little success.

Our land purchase and refuge program, so far, has for the most part been confined to the forest regions, but I feel that a substantial part of the money which has been allocated to the purchase of land should be diverted to game land development.

In addition to improvement cuttings in our forests, we are now confronted with the need for establishing many small refuges throughout our farming counties as breeding havens from which ample seed stock may overflow, or be trapped and transferred to the surrounding territory.

It is frankly admitted that as yet we have found no feasible way to induce the farmers of Pennsylvania to vary their farm practices in the interest of an abundant game crop, or to have them remove their "no hunting" signs, especially in sections within easy striking distance from large centers of population. If we might induce our farmers to harvest their corn crop, or even a goodly percentage of it, from the stalk as is done in the Middle West, that part of our problem would be much more simple.

We have followed with deep interest the steps being taken by several other States to assure well-stocked open hunting grounds in densely populated farming regions, but to date the majority of our sportsmen have been unwilling to try any of these methods. I believe, however, that the time has arrived when we shall be compelled to develop methods of our own which will be acceptable to landowners and hunters alike.

Before this can be done, extensive research and experimentation will be necessary, and in my opinion this is work which a State agency like our game commission can and must sponsor, especially in the thickly populated southeastern and southwestern farming counties, surrounding the large metropolitan districts of Philadelphia and Pittsburgh.

I believe the best way to approach such research and demonstration work is in cooperation with the agricultural extension service of our State College, in which the United States Biological Survey might be persuaded to participate. We certainly cannot hope to lease the hunting privileges on enough farm lands near our big cities to provide any appreciable open hunting territory for a considerable percentage of our 600,000 licensed hunters; and, even though that might be done, the bigger problem of managing the farming operations on those lands so as to assure an abundant game crop, and regulating overshooting, would still confront us.

I am not convinced that the mere policing of farm lands in return for the removal of the "no trespass" signs holds much hope for a hunter's paradise; enither are many of our sportsmen willing to subscribe to the theory that the best way to get landowners interested in the production of a game crop is to ruge them to charge the sportsman for hunting privileges. This question has frequently been discussed at meetings of the Pennsylvania Federation of Sportsmen's Clubs, as well as the question of adopting a private game preserve law, such as is in effect in two neighboring States, whereby a person is permitted to shoot, over an extended season, a certain percentage of the game raised and released.

It does seem, however, that through research and cooperative experimentation, in which our organized sportsmen's associations and other wildlife groups take part, a sensible, acceptable policy can be evolved which will assure both a more abundant game crop and ample farm-game hunting grounds for the sportsman who is willing to comport himself properly and to contribute his fair share toward the maintenance of favorable game habitats.

I feel that when a plan is adopted, our many hundreds of sportsmen's organizations throughout the State could do a tremendous amount of missionary work in helping to put the plan across with the landowners in their vicinity. A contest, in which prizes would be awarded to the members who were responsible for opening up more hunting grounds and an annual dinner for neighboring farmers and landowners are suggestions along these lines.

In conclusion, let me say that in my opinion State game agencies should lead the way in finding solutions to such problems as ours, instead of waiting until they are literally pushed into untenable positions, or the adoption of untried schemes of doubtful value.

We are now planning the third phase of our long-term game program for Pennsylvania, and solicit suggestions and advice from those assembled at this large gathering of wildlife enthusiasts who have had actual experience in grappling with problems such as those which now confront us in Pennsylvania.

Chairman GREELEY. These statements that come from the different States are exceedingly interesting. I know that we shall find equal interest in the statement which now comes from Mr. Arthur L. Clarke, superintendent of the State Board of Fisheries and Game, of Connecticut. [Applause.]

REMARKS OF MR. ARTHUR L. CLARK

Mr. ARTHUR L. CLARK (Hartford, Conn.): Mr. Chairman and ladies and gentlemen, public agencies have an important relation to

the wildlife problem. But as one who represents a State public agency it seems to me that we have taken ourselves too seriously.

In our efforts to discharge our public obligations, we have attempted to do the whole job. We have permitted the public to load their obligations on to the shoulders of their public servants. We have deplored the public lethargy but we have encouraged it by our attitude.

As we now enter the field of wildlife management, it becomes apparent that the situation must be reversed. The practice of wildlife management varies with each area. It considers wildlife species as a crop of the land dependent upon other crops. It can be carried out only by those individuals or groups who own or control the land.

No public agency can ever hope to practice management on all the area over which it has certain regulatory jurisdiction. None should attempt to become large enough to undertake it. Regardless of the policy, the legal right of landowners prevent a public agency from practicing management on private lands except by voluntary cooperative agreement.

The function of public agencies in the field of wildlife management will be most effective if it is confined to those activities which private agencies cannot possibly undertake.

By refusing to do the work which individuals or groups could do if they would, individual initiative and responsibility will be encouraged. That factor is essential to the solution of our problem.

To be specific, the most important function of public agencies is primarily educational. The objective can be reached more quickly if public agencies will confine their activities to such work as:

(1) Experimental or research work to determine methods.

(2) Demonstrating methods which have been proven to be practical, using publicly owned areas for such development and demonstration, leaving privately owned areas for development by private initiative.

(3) Disseminating information regarding methods.

(4) Cooperating with private agencies in coordinating activities, but avoiding doing their work for them.

(5) Establishing policies which make it possible for private agencies to carry out their programs and which encourage them to do so.

In other words and in summary, it is time for public agencies to pass the buck back to the public. The organization of the federation which has been accomplished at this conference proves that the individuals who together constitute the public are ready and willing to assume their obligations. [Applause.]

Chairman Greeley. With the consent of the chairman of the program committee, I announce that there will be but two more speakers this afternoon, the next two gentlemen on the program. There will be ample time tomorrow for those who are not able to be heard now. It is not fair to ask these gentlemen who have devoted so much time to the preparation of such vastly interesting and valuable papers to cut their time short.

The next speaker, then, is Mr. Newell B. Cook, State Fish and Game Commissioner of Utah. [Applause.]

Remarks of Mr. Newell B. Cook

Mr. Newell B. Cook. Mr. Chairman, fellow conservationists, yesterday was one of the happiest days of my life, when they adopted a constitution that had for its purpose the bringing together of all conservation organizations of America. I trust that when some other gathering is held to bring together the differences yet to be ironed out, namely, those differences between State and Federal agencies, it will meet with unanimous approval, as did this organization.

Having so little information with relation to conditions existing in the various parts of the country, I am compelled to limit my comments on game management to the manner in which it is being practiced and has been practiced in the State of Utah.

Deer in the State of Utah have increased from approximately 12,700 head in 1919 to 84,000 head in 1935. The present number of deer furnishes to the hunting population of Utah a kill of approximately 65 percent, which we consider good deer hunting.

Prior to 1912, elk had disappeared from the ranges of the State of Utah. Since 1912 there have been planted within our State, a few at a time, 193 head in 7 different areas. These plantings were made during the period from 1912 to 1925, and the elk were imported from Jackson Hole and Yellowstone Park. Under the State game management plan, since 1925 we have a record of having taken 381 cows and calves and 1,633 matured bulls, or 2,014 legally killed elk, and we now have approximately 3,500 head on the ranges; I claim this a phenomenal increase from 193 head of elk.

The production of a game herd is one thing. The management of that herd after it has been produced is entirely another. Naturally, the foundation of game management of any kind is in land usage. There is no such thing as game management by State agencies (and, by the way, that was my topic until I got here), without taking into consideration three separate and distinct landlords of the public-land States. These factors must be considered before a well-rounded-out program can be developed.

The prairie and desert lands within these States are under management by the Department of the Interior, authorized by the Taylor Grazing Act. That is landlord no. 1, coupled with four sections in each township belonging to the State, held in custody for its schools and institutions. These lands in many instances are near the National Forests, and are intermediate in their elevation, and furnish a large portion of the wintering range for our game herds.

Landlord no. 2 is the private landowner, on whose land game will be found in great numbers and in a great many instances on the land of livestock men who do not use the public range at all.

The third landlord is the National Forest Service, administering a goodly portion of the summer range.

Influencing these three landlords are many different factions desiring land usage. Realizing that all interested factions must be taken into consideration, the State of Utah for a good many years has set up what is known as a State game refuge committee and board of big game control. This board consists of one representative each selected from and nominated by the State Wool Grower's Association, the State Cattle and Horse Growers' Association, the State Sportsmen's Association, the Regional Forest Officer, the Fish and

Game Commissioner acting as chairman. Thus you can see that a scope is given whereby all landlords will be heard and their problems given consideration.

This board has power to establish game preserves after the consent of the above-mentioned has been acquired. This group is also authorized to deal with all game problems separate and apart from the regular open season prescribed by law, which open season provides for the killing of one male deer with horns not less than 5 inches in length, under a regular State license.

When, after due investigation, it is found that deer have increased to an abundance where they are doing excessive damage to public or private property, or where there is an over-grazing of the range, it is only good business for the Game Board to authorize their removal by hunting or otherwise, to reduce this number of game until there is a balance between the plant life and game, giving plant life a chance to reproduce in kind, something that has been vastly neglected in the public-land States.

Separate and apart from the regular open seasons the taking of a number of deer from congested areas has been authorized by this board.

In connection with this action it has taken a strenuous program of education to make the gunners believe that we are not going to exterminate their deer herds and at the same time make the sheep man and private landowner believe that we intend to control numbers to a point where they will not be compelled to graze large herds of deer to their own financial detriment.

In addition to this board and in cooperation with the National Forest Service, we have game and range experts whose sole duty it is to study range conditions throughout the State and report to their committee the findings relative to the uses and abuses of ranges caused by the different animals ranging thereon. These men are trained in their work, and in such work they take into consideration first and foremost the following:

Foliage and food supply on a given range;

Palatability of the different plants found thereon and its relation to the different animals;

Inaccessibility of livestock to any given range;

The various species of animals found on a given range in relation to their habits and range conditions;

Sex ratio, needed and existing;

Diseases;

Parasites and predators;

Conflict in usage of the range.

On some ranges, because of the inaccessibility to livestock and because of the topographical condition of the land, no conflict exists, and the problem to be solved is only one of game according to range capacity.

The difficult problem to be solved in management is where game must be produced when livestock is being ranged in numbers now greater than the carrying capacity of the range.

Our game herd has been produced in Utah with dual use of all lands. There is not one foot of land within the borders of that State that has been set aside solely for game. However, we have some 16 game preserves, and, by the way, when I say 16 game preserves,

the acreage is large, on which we allow little or no hunting until game have increased to such an extent that some of the above problems begin to present themselves. The game refuge committee is then authorized to open any part or portion of that game preserve for the removal of numbers as advisable. In some instances game preserves are rotated, opening one well stocked and setting another up nearby where the game population is sparse.

No one in Utah except a small minority of the livestock men will say that we have too many game. The only problem is the proper distribution and elimination of congested areas.

The above program works, but there is a feeling that such a plan of cooperation with the above interests will lead us to a point where the jurisdiction of game is a matter of question. Until the States are assured that Federal bureaucracy has no ambition of taking over the police powers granted to these public-land States there can be no perfect harmony. Naturally, I am of the opinion that States should stand on their constitutional rights. However, the landlords mentioned above, in my opinion, are charged with the responsibility of protecting the range under their supervision. And it is my belief that any State should, upon the request of these people, solve their problems and reduce their herds consistent with range condition and food supply.

When that is done a great deal of the anxiety and fear will disappear relative to the usurpation of powers, and when fear has been dispelled game will get a much better chance than it has had while fear and political turmoil have been one of the outstanding factors; and to those Bureau men who are crying of inefficiency of game departments, I would suggest that they take an inventory of themselves and put their own house in order first, with thought of game rather than with the thought of strengthening their own bureaus.

I have said that cooperation is the keynote of our success in Utah. We have had the utmost cooperation of the National Forest Service in handling our game problems, and in no instance have we had to submit to their intention to enforce game removals.

The establishment of a wildlife research station at our State agricultural college is a step in the right direction. We are appreciative of those who had to do with the establishment of a research bureau. We have had the cooperation of the National Forest Service in this respect.

We have now set up in Utah eight grazing districts under the administration of the Department of the Interior and sheepmen. The cooperation mentioned above by the National Forest Service is conspicuous here by its absence under this set-up. Article IX of the Taylor Grazing Act provided that a game committee of conservation officials, State land board officials and livestock men should be set up to control the uses and abuses, or recommend control of the uses and abuses, of range. We have not only been left out of this picture, but the committees are set up and acting, consisting entirely of livestock men. I am informed by the Director of Grazing that it may be due to our neglect; nevertheless, they are set up of livestock men; therefore the legality of the action of such a committee is questioned and the arbitrary methods condemned by the large majority of the population of Utah.

It is my belief that all the organic resources of public land, both State and Federal, should be under the administration of one governing body, and administered in the interest of benefiting the most people of America. How can we correlate the number of game or other animals on a summer range with the number on winter range with any degree of intelligence, with the National Forest Service administering our summer range and the livestock men our winter range? Since when did the United States become compelled to ask one faction of a many-factional problem to effect rules and regulations for the administration of its lands?

I am compelled to believe that the organic resources should be with the National Forest Service having control and jurisdiction within their various regions. The Department under which that service functions is and should be of no material interest to fish and game people.

In conclusion, let me sum up by saying that the game people of the public-land States must now be given consideration along with other interests, and I appeal to the people of the East to help bring about a fair usage of range for game at as little a detriment as possible to our important livestock interests who are using public ranges as a source of private profit.

Some day the forests and parks of the Western States will be used as a recreational playground for many people from eastern points. When that time comes, a well-rounded-out game management plan correlated with the scenic wonders and canyon climatic conditions of the Mountain States will have an economic value second to none in that group of States, as well as an esthetic, healthful, and sportsmanship value not to be measured by any economic yardstick. [Applause.]

Chairman GREELEY. Dr. Bennitt, of the Department of Zoology at the University of Missouri, is our next and last speaker for the day.

Before he takes the stand may I say that the chairman of the program committee asks me to state that the other gentlemen who are on the program will be heard tomorrow afternoon—not in the forenoon, but tomorrow afternoon. The change with regard to the program for tomorrow makes that possible.

REMARKS OF DR. RUDOLPH BENNETT

Dr. RUDOLPH BENNITT (Columbia, Mo.). I see there are 11 of us who were instructed to discuss the matter of game management by State agencies. Four are men from State conservation departments, six are Federal men, and one is a college professor. I sincerely hope this does not indicate the relative importance attached to college professors in the conservation business. If it does, we shall have to deserve a higher rating.

You will see from my position that I cannot give you records of excellent accomplishment such as my predecessors have given you. What I am going to try to do is to discuss two or three ideas which it seems to me have not received quite as much consideration on this occasion as they might. One is the very general nature of the central idea back of all game conservation, which is the restoration of range. By "general" I mean diffuse, affecting many interests.

Another is the necessary limitation of the activities of the conservation departments which results from the foreging. There are too many toes to be trod upon. The third is the need—a crying need which, so far as I am aware, has not been discussed at all—for cooperation between the game and fish departments and other departments of the State, including the State universities.

First let us recognize one thing—that the management of wildlife range presents a set of social, economic, and scientific problems much more complex than those involved in the conservation of any of our other natural resources, such as oil, coal, minerals and, I believe, even water power and timber. The handling of these other resources can be carried out with a simplicity of purpose, which we have had frequent occasion to witness, and a directness of action that is simply not possible in the land-use phases of wildlife restoration. The latter, in one way or another, are too apt to interfere with the established practices of numerous, strong, and well-organized groups.

Mr. Darling the other afternoon referred to wildlife conservation as an orphan child. Others have called it a stepchild. I should like to introduce another family term, the "poor relation." It is a relation, obviously, because it is represented in the State government and because it affects the interests of one out of every three or four of us directly (and indirectly many more). It is poor because we spend less money on keeping it alive and productive than on any of our other resources. In Missouri we spend not quite ten cents apiece a year on it, and I dare say the figure is not much higher elsewhere.

By the way, I must digress a moment. It strikes me as somewhat inconsistent that *all* of the wildlife program should be financed through fees received from the hunters, the trappers, and the fishermen. Here we are emphasizing the State-wide and Nation-wide importance of such a program. I hope this conference will go on record as favoring general public participation in the expense of wildlife restoration *in addition* to the license fees received from the sportsmen. We cannot very well present our argument on the basis of general public benefit if that argument does not carry with it the corollary of general public financial responsibility. [Applause.]

Going back to the "poor relation" idea, wildlife conservation visits from house to house, from Agriculture to Water Resources to Forestry to Parks and back again, taking what little it can get of the left-overs, occupying the parts of the house not wanted by members of the household, and shunted about from pillar to post with these words in its ears: "You are all right as long as you don't interfere with our drainage projects, or our disposal of waste, or our timber stand improvement, or our recreational facilities; but, after all, you aren't our special responsibility, so run along, mind your own business, and keep off the grass."

It has already been pointed out at these meetings that wildlife has no particular special prestige that must be maintained; that most of its supporters are so busy taking pot shots at the game and fish departments and at one another that they haven't time to find out whether there is anything they can agree upon, and that its restoration has often been in the hands of men who, however efficient, have nevertheless been obliged to serve their terms and give way, 100

percent, to new and inexperienced men when the political complexion of the Government changed.

Putting all these things together, it amazes me that we have accomplished as much as we have. One result has been, however, that a good many conservation departments have had to follow the line of least resistance, somewhat after the fashion of a minister I once knew. If his utterances on any social problem were a little too conservative, he alienated the support of the liberal wing of his congregation. If he inclined too much toward the liberal side, he brought down upon his head the wrath of a good many conservative parishioners, buttresses of the church, even though some of them were flying buttresses supporting from the outside. The upshot was that he finally ceased discussing the great social problems that confronted the church and still do.

For the past several years his sermons have consisted of a rehash of the theological doctrine that his predecessors have discussed for the last several centuries. He is perfectly safe, but he isn't a leader any more. There are a number of conservation departments in our country who are perfectly safe, but who aren't leaders any more.

The fields of effective work of many conservation departments have been restricted, practically speaking, to propagation, predator control, the establishment of refuges, and the enforcement of regulations which, curiously enough, they frequently had no part in making and would very much like to change. (This arrangement, whereby the legislature makes all the regulations, strikes me as being singularly incongruous.)

Now nobody in his right mind thinks that these things, however well done, constitute game range management. My point is that in some States the department has gone no farther than these three or four activities because it was blocked on every side, though we shall have to admit that in some States the department has gone no further than this for other reasons.

What can be done? This brings me to my next point: Let us look over the average State set-up and see what departments are concerned with land use. I am bringing into this discussion for the first time, so far as I am aware, State departments other than the university and the conservation department.

Besides the conservation department, the two agencies most intimately concerned with wildlife restoration would seem to be the State university and the State planning board—the university because, as a rule, it is the only place in the State where there are gathered together in one place the laboratories, libraries, and trained personnel in a dozen departments that are needed. In other words, it is the only agency that is equipped, or that can be equipped at a minimum of expense, to get at the scientific facts and to train men to go into the field. The State planning board is mentioned here because its job is coordination of diverse activities into a unified plan.

Other State departments—in Missouri, for example—that are concerned with land use, are the board of agriculture, board of health, highway department, division of lands, department of geology and water resources, and, indirectly of course, the board of education. In other States there are doubtless others, or at least separate subdivisions, such as those of parks and forests, which in Missouri happen to be under one department.

Practically all of them operate on a definite budget that permits the hiring of a certain personnel and the conduct of certain activities. The ordinary practice is to use all this money and personnel for carrying on work that belongs entirely and admittedly to the department concerned. This is perfectly natural and in some ways praiseworthy. The difficulty is that in the case of projects in which two or more departments claim an interest—and this includes most land-use projects—one of two things will happen: Either there will be rivalry between the departments as to which one shall supervise the work and get the credit, or the project will be dropped. If one department wins the argument and supervises the project, important considerations are frequently left out, with the result that time and money and tempers and public confidence are lost, and the public interest suffers.

I have a specific case in mind. Let us suppose that malaria exists in some part of a State. Of course, it must be reduced if possible, so the State proposes to supervise the drainage of the swamps as a public-health measure. The benefits prophesied include not only the eradication of malaria but also the production of new farm land. This looks very good. The drainage district is thereupon set up, bonds are sold, and work gets under way.

But here are some of the questions that might have been asked first and were not: Is it drainage that is needed to eradicate malaria, or is it screening or sanitation or something else? How far removed is the human population from the swamps? Which way does the prevailing wind blow? How far do the mosquitoes travel? Will the land be fit for agriculture after it is drained? Is the economic condition of the people such that the project won't bankrupt them? Will the project destroy the breeding grounds of furbearers, waterfowl, game, and fish beyond recall? And there are many others. In how many State drainage projects have these questions been asked and answered by impartial investigation? If they were, in how many cases was the advice followed?

Now, I ought not to cast any bouquets at the college professors, because that is not the fashion nowadays. But I must say that among professors the idea of pooling the knowledge, objectives, personnel, and funds of a number of perfectly independent departments toward the solution of a problem that interests them all is a good deal further advanced than it seems to be among our other State departments, whether political or not. I suspect there is a lesson to be learned there. It is quite true that there are a good many universities in which the departments are as thoroughly insulated from contact with one another as any State departments I ever heard of, but in a large and growing number of universities the solution of larger problems, which no department can hope to solve alone, is being sought by the combined efforts of many departments. In the University of Missouri, for example, there are four such projects, each involving the personnel and funds of at least six departments, with no one getting all the credit. Some of them even involve the participation of three different divisions of the University—medicine, agriculture, and arts and science.

There are about 700 such projects, I am told, in the land-grant colleges of the country, and there are a great many more which are not stimulated by Federal funds. This means a good deal, I think.

It is not something artificial. Rather it is the growth of a new habit of mind.

I think you can see what would have happened to some of our drainage and other land-use projects if this sort of collaboration had been carried out before the work was done. The only way that I can see to make it happen in the future is to equip the State university to get at the facts, to bring some of our other State agencies out of their hermetically-sealed compartments, to let them know in no uncertain terms that here are problems of a type for general and common cause, not to be squabbled over and not to be dropped.

This looks like pure idealism; I think it is. It is a good deal like expecting the well-known camel to go through the well-known needle's eye. But, skipping from the Bible to science, you know that in the course of evolution camels (and I dare say donkeys and elephants also) have changed their attributes. Human nature has changed; even the habits of administrative bodies have changed. The idea of the "fixity of species" is gone. It does not exist, even in the human species. Therefore we have some hope that our present impediments can be changed and that with the tremendous section of the American public represented by the group gathered at this conference, we can get certain things done if we make up our minds to do so, even the idea of common cause among State departments.

Let me now present three or four concrete suggestions, simply to give you something to shoot at:

1. When you go home, decide among yourselves and those you represent which of your State departments are primarily concerned with wildlife-range management. I should suppose these would be the conservation department, the university, and the planning board.

2. Go over the list of activities of the other State departments and decide which of them have a practical concern in the land-use changes necessary to wildlife restoration.

3. Establish a wildlife advisory committee to your State planning board. There are 46 State planning boards in the 48 States, but if you haven't a planning board, establish the committe anyway. Put on this committee one member from each of the departments you have picked out as having anything to do with land use. Let the conservation commissioner head the committee because, after all, it is mainly his responsibility and he will be the goat.

4. Watch for land-use projects on which you can make this committee do some work, and when you find them, see that all the pros and cons are threshed out beforehand and in public. This is very important. If you have the right kind of planning board, they can do this if they know you are back of them.

5. Try to see that in every case the project is carried out with due regard to what we are told every few days is one of the cardinal principles of democratic government—the greatest good for the greatest number. Make this phrase mean something more than the lip service that it often is. Carry the policy through even if, in some projects, all wildlife restoration has to be abandoned. Any other course of action will be indefensible.

Wildlife management is at heart a land-use problem, a problem for the entire State and not merely for the public lands of the State. This has been emphasized many times at this conference. The lands and waters of the State concern a good many departments, and not

merely the conservation department. The wildlife program, then, cannot proceed without the cooperation of the private landowners and of the other State departments.

Therefore, while the conservation department is responsible for wildlife administration and the university is responsible for getting the facts, the whole question of planned land use is a matter for interdepartmental action, for common cause among all the State departments concerned. This, while perhaps utopian, may be looked forward to as one of the important steps toward the goal which we all profess to seek. [Applause.]

Mr. SETH GORDON. The program committee has found itself in a difficult position and, as Chairman Greeley has already said, the balance of this program will be held over until tomorrow afternoon, because the session for tomorrow morning in this room is a very important one and it was so arranged that it would not interfere with the three separate sessions which are under way tomorrow morning.

I want you to particularly note that on that program tomorrow morning we have Mr. Robertson, Chairman of the House Special Committee on Wildlife Conservation; Commissioner Bell, of the Bureau of Fisheries, who will speak on Proposals for the Solution of the Fisheries Conservation Problem; and Mr. Gabrielson, Chief of the Biological Survey; also a message from Mr. Zinser, another from Mr. Lloyd, and finally one that you will get a whale of a lot of fun out of, as well as a lot of real information, unless this speaker has changed his tactics lately—P. S. Lovejoy, on "Harmonizing Conflicting Interests in Land Management."

You have an unusually good program tomorrow morning, so tell all of your friends to come here tomorrow morning instead of going to visit their Congressmen.

That will be all for this evening, thank you.

(The meeting adjourned at 5 o'clock.)

FRIDAY MORNING SESSION, FEBRUARY 7, 1936

The conference was called to order at 10:30 o'clock by Mr. Seth Gordon.

Mr. SETH GORDON. The chairman of the meeting this morning you all know. There is no need for further introducing him. To those of you who do not know him, Mr. Elliott S. Barker, who is the State game warden of New Mexico, who happens to be the president of the Western Association of Game Commissioners this year on reelection, is the only man who ever succeeded himself in that capacity, and he is also president of the International Association of Game and Fish Conservation Commissioners.

(Mr. Elliott S. Barker took the chair.)

REMARKS OF CHAIRMAN ELLIOTT S. BARKER

Chairman BARKER. I presume it is the prerogative of the presiding officer to make a speech. I gathered that since I came to this convention. I am not going to avail myself of that opportunity. We are already late. I want to say that I am exceedingly sorry that this snowstorm and other matters have made the crowd so much smaller

than we expected because I think this morning's program is really the heart of this whole convention. A national program for wildlife is what we all came here to learn about, and if we only have a hundred or so people it is very tragic. Nevertheless the quality of the audience may go a lot to make up for the lack in quantity.

The first speech this morning will be an address by a man who needs no introduction to any conservation audience, and I am not going to attempt to eulogize his conservation attributes because they are too well known. I will introduce to you Congressman Robertson of Virginia. [Applause.]

Address of Hon. A. Willis Robertson

Hon. A. Willis Robertson. Mr. Chairman, ladies and gentlemen of the conference, I do not think that our chairman need apologize to any of the speakers for the audience that has come out to greet us today. I, for one am agreeably surprised to find that we have this many who are deeply interested in the cause and are willing to brave one of the worst blizzards that the District has had for a long time to come here after they have already been attending 4 days of rather strenuous meetings to hear further discussion of a comprehensive and coordinated conservation program.

You know, we have, they say by the last count, about 127 million people in the United States, but of that entire number only a few have real courage, and it is the few who have the courage who accomplish things for the rest of society.

I often like to think of those words of Robert Louis Stevenson, a man frail in body but indomitable in spirit, who said: "And does not life go down with better grace foaming in full body over a precipice than miserably straggling to death in sandy deltas?"

And so when I look at this number of men and women who have the courage and enthusiasm to come through this snowstorm to attend this meeting, I feel there is real hope for the cause in which we are so deeply interested, because you are not going to be willing to see that cause sunk in sandy deltas, and if you don't make a success of what you are trying to do you will at least be able to say with Stevenson that you will go down foaming in full body in the effort. [Applause.]

Of course, it is a bit distressing to us as we assemble to consider how we can get more game in our woods and fields, to realize that we are in a comfortable, steam-heated building and that the wildlife that we want to protect and increase is subject to all of the vicissitudes of the elements. Our game is wondering this morning where the next meal will come from. Those thoughts possibly make us feel like the old Negro when the preacher was preaching about creation. He said, "Brethren, the Lord created the heavens and the earth and the earth was without form and void and God said, 'Let there be light', and then God created the dry land, God created the trees, brethren, and the shrubs, and the flowers, and the birds, but God wasn't satisfied, God said he wanted a man. God made himself a man. The first man, brethren, was Adam. God made Adam out of mud and set him up faninst the fence to dry."

317248

Ranger making a winter game survey in the Malheur National Forest, Oreg. (Forest Service photo.)

221682

A, Holocaust for wildlife—a night forest-fire scene in the Columbia National Forest, Wash. (Forest Service photo.)

316955

B, Mules packing supplies into Montana mountains for winter game survey by Forest Service. (Forest Service photo.)

An old Negro back in the back of the audience said, "Parson, you said Adam was the first man?"

"Yes brother."

"And God made him out of mud and set him up faninst the fence to dry?"

"Yes, brother."

"Parson, who made the fence?"

The parson said, "Brother, them's the kind of questions what hurts religion." [Laughter.]

There are a good many unanswered questions about this wildlife situation, but in a radio address on January 24, I predicted that this would be the most important conference of the kind ever held in the United States. In my opinion that prediction has been fully confirmed.

For some years I have kept in touch with conservation conferences. No previous conference in my recollection has been so largely attended or so adequately representative of the varied conservation interests of America. None has so fully covered the conservation field, none has attracted as much public interest. Last, but not least, no previous conference has been as successful as this in presenting the problems that confront us and in formulating a comprehensive and coordinated plan for solving them.

For the first time in my recollection a conference on the subject of wildlife conservation has been regarded by the rank and file of the people of the country as evidencing something more than the esthetic aspirations of a small group of nature lovers or the recreational inclinations of our city hunters and fishermen.

It has always been my contention that no substantial progress would be made in wildlife conservation until a program, in which city hunters and nature lovers were interested, could be definitely connected with a program of financial return to the farmers on whose land most of our wildlife is produced. If that highly desirable end has not already been accomplished it will be accomplished when the proceedings of this conference have been printed and distributed throughout the rural sections of the United States.

As nations go, we are a young nation. Even in terms of the city state, which we are prone to regard as but a temporary phase in the history of civilization, we are young. Athens, for instance, the seat of political philosophy, as well as of art, flourished for some 900 years before yielding to the Roman legions, as compared with our three-hundred-odd years since the first permanent settlement at Jamestown. Yet we are old enough to realize that there are no new and fertile frontiers to which agriculture can move, and the plight of agriculture, which began to be acute at least 3 years before the stock-market crash of '29, has challenged the constructive leadership of our best economists. It is now generally conceded that bankrupt farmers mean a bankrupt nation, and that prosperous farmers mean general prosperity for the rest of our people. Therefore, in trying to find ways and means of restoring prosperity to the farmer, we have been forced to give consideration to the many factors that have sapped the wealth and vitality of our rural sections. These studies have disclosed the tremendous economic losses to the landowners of

America that have been caused by forest fires, erosion, stream pollution, and the needless destruction of valuable species of wildlife.

Take the subject of privately owned forests, for instance. When a fire occurred on a privately owned woodlot the owner knew he had suffered a loss, but it did not greatly disturb the remainder of that community. But when we tabulate all of the private fires and find that they destroy about 40 million acres of timberland annually, it is not difficult to estimate a loss of wealth in the rural sections that runs into the hundreds of millions. Unfortunately that loss does not stop with the immediate loss of the individual timber owner. The future productivity of the burned-over area is set back for at least 25 years, and in many instances, especially in some of the burned-over areas like we have in Virginia that re-seed to scrub oak and chinquapin bushes, the productivity of the burned-over area is destroyed for commercial timber 100 percent.

But the loss does not stop there. The small sawmill can't operate in a burned-over area, and hence that opportunity for local employment is gone. The planing mill in the nearby town has lost its supply of raw material and its opportunity for giving employment is reduced.

With the loss of timber resources on the Atlantic Coast the prospective home-builder is forced to go to the Pacific coast for his building material, but when he finds that the cost of transportation from the Pacific coast to the Atlantic coast is frequently greater than the original cost of the lumber, he decides that it is too expensive to build and he will postpone the erection of that new home. And there is a resultant stagnation in the building trade which extends to the manufacturers of durable goods.

Thus we have a vicious economic circle that started from a careless and needless fire on a privately owned wood lot. That, of course, is purely from the financial standpoint and has not taken into consideration the loss of wildlife which had previously found a habitat in the burned-over area.

The same problem is involved in soil erosion. The washing away of fertile topsoil of 100,000,000 acres of previously fertile and productive land occasioned an economic loss that did not stop with the first private owner. As with the burned-over timber land that loss of natural wealth extended and ramified throughout all elements of society.

The Good Book says that no man liveth unto himself and no man dieth alone. That principle applies with equal force to our economic lives. Destroy wealth, natural wealth, in any form, and all society suffers. Conserve, develop, and rationally use natural wealth and all benefit.

This conference, therefore, will be a landmark on the high road of conservation because for the first time those who love nature and those who love to hunt and fish are willing to coordinate their program with a program that will result in greater material prosperity for the rural sections and greater opportunities for health and happiness for the people at large. And if I correctly understand the plans now being formulated for the organization of a great national association, those who till the fields, those who operate ranches and produce livestock will be brought into the picture and given a voice

in the direction of this national conservation movement. Is that correct? Frankly, I do not believe the movement can be a success on any other basis.

Our friend, Darling, has already told you we must eliminate from this movement politics, prejudice, selfishness; there must be no unseemly wrangling over who is to carry the flag and who to receive the accolades. All efforts must be directed toward the ultimate objective of conserving our timber resources, fertility of our soil, purity of our streams, and a suitable abundance of our native wildlife.

If a great national organization, extending into all of the States and into the political subdivisions of the States, can be made to function with harmony and unity of purpose, there will be no difficulty about the cooperation and assistance to be rendered by the Federal and State governments.

The speakers who will follow me will outline the splendid progress that has been made during the past 2 years by the two Federal agencies which are exclusively concerned with wildlife conservation, the Bureau of Fisheries and the Bureau of Biological Survey. Much credit is due these two bureaus for the progress they have made in the last 2 years in coordinating their conservation activities with the activities of other Federal agencies that touch the field of conservation.

Splendid cooperation has been developed in stream restocking work between the Bureau of Fisheries, the Forest Service, and the National Park Service.

The Bureau of Biological Survey of the Department of Agriculture and the Reclamation Service of the Department of the Interior have worked out a cooperative plan respecting the administration of reclamation projects which are also wildlife reservations and refuges, and I want to digress here to say that, in my opinion, we owe the consummation of that cooperative agreement to the activities for over a year of Hon. Jay N. Darling, who realized what it meant to the ducks when he was trying to conserve water areas and the Reclamation Service was trying to drain them. [Applause.]

I would be less than frank if I did not add that something remains to be done with respect to coordinating the conservation activities of some of our emergency agencies.

Reference has been made during this conference (I won't say by whom, but it has been made) that there is apparent lack of interests among Members of Congress in a national conservation. program. That supposed lack of interest has been more apparent than real. I do not know of a single Member of the House or Senate who is not willing to lend his support to a proper conservation movement on a national scale, but the work of Congress is done by committees, and jurisdiction over conservation matters has been divided among various committees in the House and Senate whose major concern has been with other problems and problems which at the time appeared to be of greater importance. Until the special conservation committees were created in the Senate and the House, there were no committees willing to give exclusive attention to conservation matters, no committees studying the problem of developing a coordinated plan. The usefulness of these two

special committees has been limited by the fact that they do not have actual jurisdiction to pass on and report out bills. By courtesy I believe the Senate committee does report bills dealing with wildlife conservation, but the work of the House committee is merely advisory to the standing committees that have the jurisdiction to take final action.

The House committee, however, has devoted much time and study to the activities of Federal conservation agencies with a view to proposing to the Congress a program of action. Closer contact, of course, could be established between the Federal conservation agencies and the Congress if we had in both House and Senate standing committee with power to act. You can hardly expect Members of Congress to enthuse over a program they know nothing about.

Members of Congress are sent from time to time copies of speeches made by those in charge of emergency agencies, but that is about the limit of our information concerning the conservation activities of those agencies.

If there is to be a North American program for wildlife restoration with adequate funds appropriated in the years to come by Congress to finance the participation of the Federal Government in such a program, there is a need for the formation of an agency of the people such as has been proposed by this conference to formulate policies that will have the people's endorsement and support, and a definite committee of both House and Senate to handle the legislative program so presented. [Applause.]

City sportsmen have known for some time what has happened to their former good hunting and fishing. Our farmers are beginning to realize what the failure of a proper conservation program has meant to them in dollars and cents.

In fact, I hope our farmers have at least reached the point with respect to the waste of natural resources where they feel like the old farmer attending the camp meeting when the evangelist was preaching upon the horrors of hell. The evangelist said, "Brethren, hell is a lake of brimstone and fire and sinners will be plunged into that lake and there they will simmer and broil and fry through all eternity."

After the meeting one old farmer went up and said, "Parson, did you say that hell was a lake of brimstone and fire?"

"Yes; I did, brother."

"And that sinners are going to be plunged into that and there they are going to broil and fry throughout all eternity?"

"I certainly did, brother."

"Well, parson, I just want to tell you the people won't stand for it." [Laughter and applause.]

Chairman BARKER. Thank you very much, Congressman Robertson, for your splendid talk. I am sure we all enjoyed that talk very much and will get a great deal of good out of it.

A North American program for wildlife restoration is the next item to come up on the program. Such a program naturally includes two major phases, that relating to fish life and that relating to birds and animals. The discussion of proposals for the solution of the fisheries conservation problem will now be discussed by the Honorable Frank T. Bell of the Bureau of Fisheries. [Applause.]

Address of Mr. Frank T. Bell, Chief, U. S. Bureau of Fisheries

Mr. Frank T. Bell. Mr. Chairman, Mr. Robertson, ladies and gentlemen: This conference has been divided up into several divisions representing the various phases of wildlife conservation. Different ones representing different bureaus presented their views of the matter showing where they think they fit in their respective niches in this conservation movement, so I have prepared here an address to show what the Bureau of Fisheries is trying to do to carry out its part of this program.

The United States Bureau of Fisheries was organized by act of Congress, in 1871, to solve the conservation problem, then acute, as it related to the diminishing supply of food and game fishes in our coastal and interior waters. Since that time, various solutions have been offered. However, today, we are called upon to find a new solution, not because the former proposals were wrong, but because—like the poor—problems of conservation are ever with us. One hundred years from now our grandchildren will be engaged in an equally earnest effort to find solutions of the conservation problem, for as long as fisheries exist new problems will arise in the ever-changing world of living things, to which old formulas will not apply and to which even past experience will have but limited application.

Our responsibilities today are entirely different from those that wrinkled the brow of Spencer Fullerton Baird, the first Commissioner of Fisheries. They require new solutions if we are to keep abreast of our times, if we are to prove ourselves competent to face the crisis in wildlife that has been so dramatically described to you by many speakers at this conference.

The Bureau of Fisheries uses the old word "conservation" in the modern sense. It still means, as of old, the protection of our fisheries resources from destruction, and the limitation upon catch wherever the fisheries encroach upon the capital stock required for perpetuating the various species. It implies restraint on personal liberty to exploit public property for private gain. But with the teeming years of national expansion, and in spite of our efforts at protection, has come the catastrophe of depletion of formerly abundant and valuable fish supplies. Conservation has therefore been expanded lately to mean, in addition to its negative phase of mere protection, the restoration of vanished wealth, the renewal of breeding supplies, the rehabilitation of dwindling runs. It has also come to mean the restoration of habitats; the rescue of babbling streams, limpid lakes, and murmuring rivers from the clutching hand of filth and slime and poison, discarded by a heedless civilization. It means the reopening of waterways to ancestral spawning grounds of our anadromous fishes, blocked by the dams of industry. It means repopulating our boyhood fishing holes with the darting shapes of trout and bass and sunfish.

These are the conservation problems of today, but to build wisely in the present is also to build wisely for the future. With these objectives realized, we are compelled to consider probably the most important aspect of conservation—wise management. It is a hackneyed truism that "conservation means wise use," but the fun-

damental aim of all efforts at conservation of wildlife resources is human betterment. What can contribute more richly to the fuller life than the protection and enjoyment of our fellow creatures on God's green footstool? The Creator gave Adam dominion over all the creatures of the earth, of the air, and of the waters beneath. Adam's sons are therefore faced with the responsibility of exercising this dominion wisely. From the present day on, conservation must mean wise management and utilization.

On May 11, 1934, I presented to the Special Committee on Conservation of Wildlife of the House of Representatives of the Seventy-third Congress a bare outline of the conservation program of the Bureau of Fisheries. I can do no better here than to repeat and amplify the major portions of this plan which embraces the fishery resources of the Nation as a whole. I must ask you to bear with me in considering conservation of the commercial fishes, as well as those that find chief favor with the sportsman and angler. I do not apologize for this inclusion, for this conference is concerned with all the wildlife resources of our continent, and I wish to announce the startling fact, even though it has been overlooked, or given but scant attention, in the handsome and voluminous reports of the National Resources Board, and was also neglected in the brief report of the President's Committee on Wildlife Restoration, in 1934, that the supply of marine fishes of our coastal waters, of the Great Lakes, and of the high seas banks, within reach of our bustling ports, constitute a national wildlife resource of vast proportions.

They likewise contribute an important and indeed an indispensable element in our national dietary. The industry that depends on their capture, processing, preparation for market and distribution, and the furnishing of ships, machinery, and equipment has significant proportions in our national economy. Furthermore, this great segment of our fishery resources, although less apparent to the great bulk of our inland population, is suffering from want of wise conservation in certain branches and in certain areas as severely as our national supply of ducks and grouse and elk and trout and trees.

The future conservation program of the Bureau of Fisheries, requiring as it does the full coordination of Federal activities on the one hand, and liberal cooperation on the part of State governments and private organizations on the other, may be divided into two major categories. One is concerned with the conservation of the food and game fishes of interior waters now largely used for sport and recreation by millions of our citizens which I shall discuss under three headings: First, the protection of existing supplies; second, the development or expansion of those resources; third, the reclamation of fishing waters. The other category deals with the economic management of the commercial fish supply, including the stabilization of yield, rational exploitation of the supply, and wise use of fishery products. I shall take up the conservation of food and game fishes in interior waters first.

CONSERVATION OF FOOD AND GAME FISHES IN INTERIOR WATERS

The protection of existing fish supplies.—There is little need to justify a proposal to protect our existing stock of fishes. Certainly the majority of our fishery regulations prescribing size limits, creel

limits, and closed seasons are intended to conserve in the old-fashioned sense. Situations vary so widely as between mountain and plain, East and West, North and South, warm water or cold water, near large cities or in remote wildernesses, that such restrictions must be locally designed to meet local needs, and locally applied and enforced.

In considering the protection of natural fish supplies from the national standpoint rather than the local, I wish to point out certain influences working on a large scale that should be curbed in order to render adequate protection or to permit expansion of the resource. I refer to the encroachment of industrialization, particularly the development of water power, irrigation, and the canalization of rivers in the interest of commerce. For the important anadromous fishes, the construction of hydroelectric dams spells doom unless our ingenuity, coupled with adequate working tools, be capable of coping with the menace.

The disappearance of the shad and the alewife which formerly supported whole communities on many of our Atlantic coast streams, and the destruction of that peerless denizen of the deep, the Atlantic salmon, may very largely be credited to the succession of small mill dams in New England and the occasional larger power dams in the Middle Atlantic and the South.

Likewise the development of irrigation in the West is taking a heavy toll of the Pacific salmons and the steelhead trout. Not only do the diversion dams create barriers that are permitted to remain insurmountable, but the canals themselves provide broad highways of destruction amid alfalfa fields and orchards for the hapless fingerlings that follow their normal instincts to travel down current to their feeding grounds in the sea.

These problems are at present most acute in the Pacific Northwest where the discharge of the Federal Government's responsibility in providing ladders and screens for fish protection has only begun to be feebly carried out by a single year's allotment from emergency funds. One year is not sufficient, for complex and difficult problems must be solved in biology, engineering, law, and economics. A definite, well-recognized, and publicly avowed policy for the coordination of the conflicting interests of agriculture, industry, and fisheries at this vital point of contact should be adopted, and a permanent organization with annual appropriations commensurate to the undertaking should be provided. The battle to protect wildlife against industrialization will continue as long as our country develops.

As plans for extending our water-borne commerce in interior waters in the United States develop, concerted efforts will be required to prevent drastic changes in natural river conditions incident to these developments which will seriously reduce the productivity of our larger rivers. Probably a ship canal is the poorest place in the world for our better food and game fishes to live. Promising results are being attained in devising the canalization of the upper Mississippi River with the least harm to the food and game fishes. Some research work fundamental to long-range planning on this phase of national conservation has been conducted on a shoestring basis in the past, and should be provided for more adequately in the future.

The protection of the existing fish supplies against destruction, by the encroachments of stream pollution, should be logically considered at this time, but the evil of pollution is so widespread and its effects on the aquatic fauna and flora so drastic that I shall consider it later under another heading.

The development of fishery resources in the interior waters.—The restoration of formerly abundant supplies of food and game fishes in lakes and streams brings at once to mind the far-flung enterprise of artificial propagation which has long been liberally supported by the State and Federal Governments throughout the land. In this work sportsmen's organizations have rendered valuable service in assisting in rearing fry to larger size and in their actual planting. Such cooperation has effectively extended the efforts of governmental agencies, and its further development will yield dividends to such organizations, through a feeling of satisfaction and a personal interest in the welfare of their charges, as well as in a "reduction of the time between bites."

The extension of fish cultural facilities throughout the country has afforded considerable employment during this period of national stress—new hatcheries have been built, more ponds excavated, better water supplies developed, and more fish are being reared. Federal and State appropriations from regular sources, however, have not increased, and we face the distinct danger that the necessity for economy will curtail rather than expand budgets for maintenance and operation of the extensive equipment now functioning. Penny-pinching in this direction would be false economy. It will be necessary to consolidate our gains if the ever increasing demands for more extensive plantings are to be satisfied.

But the planting of fish, unfortunately, does not always result in filling the fisherman's creel. More attention must be paid to what L. J. Henderson has called "the fitness of the environment." Our planting programs must be planed on the basis of sound scientific information regarding methods, sizes, species, available food supply, and other natural characteristics of the streams and lakes.

During the past year a most effective cooperative project was developed with the Forest Service in the conduct of stream surveys in the interest of perfecting a rational stocking policy for interior waters of the public domain, which provide for the first time detailed records of the physical characteristics of the streams, their carrying capacity in food and game fishes, and the details of stocking requirements and practices that should be followed. This information will serve as a guide for the Federal Bureau of Fisheries, for the State fish and game departments, and for the Forest Service in maintaining and improving fishery conditions in widely scattered areas throughout the country.

The program of stream and lake improvement, which was conducted under the supervision of the Bureau's experts, is directly coupled with the stream surveys. The work of installing actual physical improvements in these waters was performed by the Civilian Conservation Corps. This work was financed by the Public Works Administration and ended in the year it began. If it is to bear full fruit for the benefit of the anglers of the whole country, it should be extended and continued for a number of years, until all

of the forests in the public domain have been brought under scientific management; and similar technical surveys and improvements should be conducted in States, outside of the national-forest areas. Particularly will such work be of utmost value in improving fishing conditions in the vast area of submarginal agricultural lands to be acquired by the Federal Government in connection with its coordinated wildlife development program.

The reclamation of fishing waters.—In nearly every county of the United States, particularly in the more densely populated sections, great stretches of beautiful streams, formerly richly productive of food and game fishes, have been made barren of life or seriously menaced, soured by sewage, poisoned by potash, murked with mud, and cluttered with cans. So far as I know, no figures have ever been assembled to show the extent of this shameful state, but there can be no doubt that the loss of wealth from this cause in the past quarter of a century has been tremendous. The report of the National Resources Committee on Water Pollution, issued in July, 1935, states—

> From the replies of 36 States, to a questionnaire seeking data on which to base an estimate of the economic and social effects of the destruction of fish, waterfowl, and other wildlife by pollution, it is evident that available data permit only general conclusions.
>
> Reasonably comprehensive and accurate surveys of this group of problems are generally lacking in this country. Such studies are essential before any close evaluation of the large economic losses in this field is possible. An extension of such studies as those made on the upper Mississippi River jointly by the State boards of health of Minnesota and Wisconsin would be very helpful. In that study, for example, it was reported that the annual loss to commercial fishing and clamming is $95,000; the annual damage to sport fishing and attendant industries, $35,000; while decreased property values in the Twin Cities was estimated as $2,000,000; and damage to lands for recreational purposes at $1,500,000.

So far as the Federal Government is concerned, pollution has meant until recently only the bacterial contamination of waters for domestic use or for recreational purposes, rendering them dangerous from the public health standpoint, or the discharge of oil from shore industries or from shipping, thus increasing fire hazards in navigable waters. Only the States are concerned legally with the pollution of streams from the point of view of the destruction of aquatic life. The Bureau of Fisheries has very recently undertaken, in a small way, a study of this latter problem and is making such rapid progress that the opportunities for effective conservation work are becoming plainly apparent.

From the fishery standpoint, the chief problems from pollution may be classified under three heads: Organic wastes, inorganic wastes, and erosion silt.

Most of these organic wastes, if properly treated, could be reclaimed and utilized as fertilizer is used on the soil, increasing the productivity of fish food and food and game fishes in inland waters. Properly utilized, they would be transformed from a menace into a positive benefit that is now wasted.

Some inorganic wastes, chiefly from industrial processes, are harmless and may be disregarded, but most are highly toxic, and if segregated and treated separately from domestic sewage, may be

neutralized and rendered harmless or their access to fishing waters may be entirely prevented.

Erosion silt is a growing menace of alarming proportions, both to the agriculturist and to the aquiculturist, for it robs the land and ruins the waters, excluding the light and blanketing the bottom.

Attack upon the pollution problem, therefore, should be conducted on a threefold basis: First, by the fishery biologist to determine what elements polluting our streams are harmful to aquatic organisms and the precise way in which the injury is done, or what elements can be utilized in increasing fish production; second, by the sanitary engineer, who has the knowledge and skill to devise means of properly treating organic wastes so that their components can be made most readily available to the microscopic flora of the water which provide food for all acquatic life; third, by the chemical engineer to device proper treatments for reclaiming as valuable byproducts the industrial wastes now poured into the streams untreated, to poison their entire lengths and render them barren.

This by no means exhausts the list of ills and remedies for freshwater fish, but serves as a bare outline of our most pressing problems. The ills of the commercial fisheries are no less urgent and equally worthy of consideration by a national wildlife conference. Let us now consider briefly the problems facing "the men who go down to the sea in ships" and risk their lives in one of the oldest occupations.

MANAGEMENT OF THE COMMERCIAL FISHERIES

Stabilization of yield.—Most of the ills of the commercial fisheries may be traced to the lack of knowledge concerning fluctuations in abundance of the supply. The fishing industry is often criticized for failure to conduct its affairs in an orderly, economic manner. Yet this hardly can be done if it cannot be told from one year to the next what will be the volume of produce available and of what kinds it will consist. This situation makes for a huge economic waste, occasioned by unforseen gluts and famines, gluts that drive down the fish to prices that are ruinous to the fishermen, and famines that drive the prices up to levels that discourage consumption and contract market outlets so that the following oversupplies can be even less readily absorbed.

Recent scientific work has proven that these vast variations in supply in some of our most important fishes can be foreseen, for in many cases they have been shown to be due to unequal reproductive success, and in others to changes in oceanic conditions. Rapid strides have been made by the Bureau's investigators in the past few years toward realizing the goal of issuing annual predictions of yield in three of the country's most important fisheries, including certain runs of salmon in Alaska, the haddock in the North Atlantic area, and the mackerel caught from Virginia northward. This service is designed to remove much of the economic risk from a notoriously hazardous enterprise.

Moreover, a foreknowledge of the extent of the annual supply permits of a greater degree of management. Two notable examples may be mentioned, namely, the halibut fishery of the North Pacific and the mackerel fishery of the Atlantic. Plans were formulated

to so regulate production as to prevent oversupply in the market, thus maintaining returns to the industry that will balance cost of production and at the same time largely prevent the waste of an abundant supply spreading the peak of production over many years instead of squandering it in an uneconomic manner.

If regulation of production in agriculture is desirable, it is even more desirable for the fisheries, for, unlike farm crops, if the fish are not marketed in one year they will remain in the water to provide continued productivity in future years. Only a start has been made in this direction. Much scientific knowledge is yet to be acquired and much experience to be gained before predictions of future yields can be entirely reliable, but the goal is worth untold effort.

Rational exploitation of the supply.—The history of the commercial fisheries, with few exceptions, up to the present time has been one of unlimited and unregulated exploitation, paralleled only to our unbridled use of our forest and mineral resources.

With the exhaustion of nearby fishing grounds and the depletion of popular staple varieties of fishes, enterprise has pushed farther afield to more distant grounds and less valuable species have become important in the market. The shad, the sturgeon, the Atlantic salmon, the cisco of Lake Erie, the salmon runs in the Sacramento River, in Puget Sound, and the Fraser River, and the halibut of both the Atlantic and Pacific Oceans are good examples of fisheries that have been depleted and of national wealth that has been squandered. No longer are new fishery supplies available, and the time has therefore come when rational exploitation, or wise use of the supply, must supplant unplanned and unregulated activities.

Overfishing must be prevented by legal restrictions which may be accomplished in various instances by State laws, by interstate compacts, and in some cases by international treaties. Moreover, destructive methods of fishing must be curbed. Tremendous waste of undersized and immature fish too small for economic utilization is common in most of the great fisheries, and methods of fishing should be so regulated as to prevent such useless waste.

The Bureau has recently been instrumental in forming an interstate conservation council, which doubtless will be effective through its regional committees in bringing the attention of the various authorities to the need for coordinated regulations. At once the need for additional information will be felt.

Fishes do not recognize State boundaries, and State laws will be of little avail where interstate fisheries are concerned unless such State regulations can be properly coordinated. Specific information will therefore be required regarding the migration of fishes, and in this field of investigation extensive cooperation will be required.

A simple statement of the principles by which safe exploitation of the supply can be accomplished will clarify the purposes of the Bureau of Fisheries. With few exceptions in particular fisheries, one of the simplest principles of animal husbandry may be applied to the commercial fish stock, namely, that the individuals of any species should be marketed at the time when they are of greatest economic value to the industry and to the consumer, and that they should be protected at the time when they are of greatest biological value to the species as brood stock. Specifically, this means that fish should not

be taken until after they have passed the stage of most rapid growth and until they have spawned a sufficient number of times to assure continued productivity. Thus, in general, small and immature fishes should remain in the water to complete their growth and to deposit their eggs. After maturity has supervened and the growth rate has fallen, they may, in general, be marketed with the greatest profit.

Just how the balance may be maintained between reproduction and growth on the one hand and mortality from natural causes and commercial enterprise on the other is a matter that must be determined by continuous observation, using statistical and biological methods. Success in this field can be assured not by one year's investigation, regardless of how intensively the study is pursued, but by continued vigilance throughout the years as long as the commercial fisheries exist.

Wise use of fishery products.—The third field of activity affecting real conservation of the fishery supply lies in the direction of the wisest and most economic use of the products of the commercial fisheries.

The extent to which Government may or should influence or control commercial activity is a matter of controversy between two schools of political thought. There can be no doubt that sound economic planning will promote true conservation of the fisheries through complete utilization of the fishery harvest and through the prevention of waste in every branch of the fishery trade.

Technological research in perfecting methods of preparation and preservation of fishery products, the recovery and utilization of byproducts, and the discovery of new uses for these products and byproducts prevents waste of a dwindling resource. Prevention of spoilage from the moment of capture to the final delivery for consumption tends to conserve the supply. Statistical information for the use of the trade promotes orderly marketing and prevents dumping. Market surveys discover new trade outlets, promote the more extensive use of a health-giving food product, and popularize abundant but little known species, thus reducing the drain on popular but depleted kinds. Standardization of grades will tend to prevent the marketing of undersized fish, and by penalizing the careless producers will prevent spoilage or deterioration of prepared products.

Throughout this address I have repeatedly referred to gaps in our knowledge of facts and principles, and to uncertainty as to methods and procedure. It has often been said that our failure to conserve our wildlife is through lack of consistent application of technical knowledge already available; that additional research is unnecessary; that action is now required. While there is much truth in this view, and while it is true that the protection of our fish and game often has been entrusted to those who are unfamiliar with more recent advances in the biological sciences, I cannot hold with those who maintain that additional research is a waste of time or money. Particularly in the field of fishery management we are faced with unanswerable questions concerning both principle and method. And even where method is known and can be applied, the precise effect of any procedure we may decide upon can only be measured by trained observers. There is therefore a most important and indispensable place for continued scientific research in every program of wildlife conservation. So long as the fisheries exist, new problems

will be presented that can be solved only by patient and often obscure labors in the vineyard of science.

I thank you. [Applause.]

Chairman BARKER. That brings us to the second phase of the wildlife restoration and without further procedure I am going to introduce to you Mr. Gabrielson, the new Chief of the Bureau of Biological Survey. [Applause.]

ADDRESS OF IRA N. GABRIELSON, CHIEF, U. S. BIOLOGICAL SURVEY

Mr. IRA N. GABRIELSON. Mr. Chairman, ladies, and gentlemen, I have a prepared talk here. It seems the fashion to do that. I never did succeed in reading a talk yet. If you want to read it, you may find a copy of it after I get through.

"Ding" Darling, after he became Chief of the Biological Survey, made the statement many times that we had no official national program for wildlife, with the sole exception of migratory birds. I think that that is certainly true. We have talked a lot about the needs of wildlife, but the Federal Government as a government has never had any official concern with wildlife except the birds that migrate between the United States and Canada. We have had many other national programs serving other interests and other needs. We have, for example, a national highway program which, carried out in cooperation with the States and local governments, has covered this country in the last few years with a great highway system that didn't exist even in my own memory. It has been a huge success from the general public standpoint, but this very highway system that has been built as part of a national program has added immeasurably to the difficulties of the wildlife administrators. It has also added to the difficulties of the wildlife species in finding a place where they might live and survive.

We have had a national program for agricultural education which has been a huge successs. This program has taught farmers better methods of cultivation and greater efficiency in production. As a by-product, however, it has destroyed hedges, old fences, and patches of brush that made cover on farm lands for wildlife.

We have a national forestry program, fortunately starting early enough and on a scale large enough to insure not only the perpetuation of much of our forest resource, but an orderly and wise use of a lot of it. It meant not only a conservation of existing resources, but also a restoration program that it mow well under way, a very fine program for bringing waste and submarginal land into public ownership and using it for growing trees.

We have other national programs—reclamation, irrigation, and flood-control programs—all of which are big enough and in all of which the Federal Government is vitally enough concerned for them to be called national programs. But nowhere in the picture do we see anything comparable for wildlife.

No wonder "Ding" said that wildlife was the poor relation subsisting on the crumbs which fell from the other fellow's table.

I don't think that I or any other man or group of men can have wisdom enough to sit down now and outline a national program. Even if we could make one that is satisfactory for today it might not apply and be usable to a great extent 50 years from now. Put the

process in reverse. Who among us here 75 years ago, considering the natural resources of this Nation, would have been able to devise a program for wildlife conservation and use that would have met the tremendous industrial development and the tremendous increase in population that have come in this country in the past three-quarters of a century?

We can, however, outline some of the present-day needs of wildlife and what we think the National Government should do about meeting these needs.

What do we need in a national wildlife program? Well, the first thing that wildlife needs is land. It is absolutely a primary essential. Birds cannot nest on the wing, nor can animals reproduce on the run; they must have places to live, to find food, shelter from the elements, and cover for escape from their natural enemies.

As a Federal responsibility this Nation should complete the program of migratory waterfowl restoration that Darling started 2 years ago. He laid out a program calling for seven and a half million acres of breeding, feeding, and resting grounds as the absolute minimum consistent with the restoration and conservation of our waterfowl resources. This program is approximately one-half completed. It needs to be finished.

The Federal Government should further assume the responsibility for maintaining primary refuges for other major species, particularly those that are becoming rare or are threatened with extinction. It should purchase land, where necessary, to provide refuge and sanctuary for these animals, not only to insure the perpetuation of the species but also to provide animals or birds for the restocking projects that must eventually be undertaken in many parts of our country if vast stretches of it are not to remain barren of their original wildlife inhabitants.

If you stop to think, you will all realize that the Federal Government is a mighty land manager. It has tremendous areas of land under its control. Of these areas the largest single unit is in the national forests. We have about 165 million acres administered primarily as forests. This is growing somewhat, and in addition there are many hundreds of thousands of acres in State forests.

The Federal Government has over 15 million acres in national parks and monuments set aside for their spectacular, scenic, and historic value, and sometimes for their wildlife value. They are administered primarily as recreation areas, and in addition to this there are hundreds and thousands of acres of State parks and local parks.

When we talk about wildlife areas, we have a serious contrast. There are at present less than four million acres, even as optimistically as we could stretch the figures, under administration primarily for wildlife-refuge purposes. Don't take these statements as a criticism of these agencies. They are not intended as such. I am envious of the supporters of those two very important projects who have been alert and wise enough and far-seeing enough to develop such programs. I am sorry that we can't put out such a beautiful picture from the wildlife standpoint.

It is not and should not be the aim of the wildlife interests to take away or detract in any way from these other organizations

and activities. Their entire tendency is beneficial to our program. We do think, however, that the wildlife program is important enough to receive far greater public support than it has ever received in the past.

That is one of the first considerations—land for taking care of these animals in a national program.

Second, we need a program of cooperation between the Federal and State governments. The States, I know, are interested in this wildlife work, and we have had such cooperative programs in other lines that have worked successfully. I spoke of the highway program and the agricultural education program. There are many others that might be mentioned.

As I see it, a Federal-State wildlife program, to be effective, should be twofold. We have in the past year undertaken what I believe is a most far-reaching and significant program as an aid to the wildlife movement. This is a cooperative research, demonstration, and educational project between the State game commissions of nine States, the land-grant colleges of those same States, and the Federal Government. In these projects we are working on basic research programs of interest to the local administrative agencies that are handling wildlife problems, the needs of the game commissions of the States being the prime consideration in outlining the research. In addition to those studies, which are basic, we are taking already known wildlife material, modifying it where necessary to meet local needs, and conducting demonstrations on land that is either owned or controlled by some one of the cooperating agencies to show people exactly what might be done in land management for wildlife use. Perhaps the most important feature of these cooperative projects is the attempt to set up a mechanism for feeding into the agricultural extension services, 4–H clubs, and schools the available information on wildlife needs and what may be done about meeting them. I think that for the first time there is now a definite program for getting into the existing educational machinery wildlife material in usable form. These cooperative units have already demonstrated their usefulness. They are real cooperative units. The game commissions, the agricultural colleges, and the Federal Government together make up the program and together work it out.

Furthermore, I see no reason why the Federal Government should not assist the States in some of their other wildlife problems. To me one of the great tragedies of the whole conservation movement is the financial uncertainty in State game agencies. Most of them are dependent on license fees for hunting and fishing, and those license fees fluctuate tremendously. This uncertainty seriously cripples many conservation activities, and as if the commissions' own financial hazards were not enough, the ingenuity of other interests in chiseling money from the fish and game organizations is something to marvel at if it weren't so tragic. [Applause.] I have known of money to build statues, to build highways, and to do all other kinds of things that might be of political advantage to someone, being taken from the State game funds. Because of this and other handicaps, the State agencies have hesitated in many instances to embark on any kind of a refuge or landownership program.

They simply haven't done it. The Federal Government does cooperate with existing State organizations in other fields in helping them solve this problem. I offer as a suggestion that the Federal Government might well make provision to help State agencies finance wild-life restoration programs and refuge-acquisition programs where it is necessary for the perpetuation of their wildlife or the development of their conservation activities. If it is possible for the Federal Government to help finance highways, to help finance the acquisition of forest lands, and to help set up agricultural experiment stations and acquire lands for that purpose, I see no reason why it shouldn't do the same thing for wildlife.

Third in our needs for a national wildlife program is a closer coordination of Federal activities, making more effective not only the Federal Government's work, but also the needed cooperation with the States. There has been a great deal said about Federal coordination of wildlife work. I just want to say that I have learned a lot of things about this subject in the year that I have been in Washington. The differences and difficulties between one and another of the agencies handling the conservation activities of the Federal Government are more apparent than they are real. I have never had any difficulty in going to any one of the conservation agencies and getting help if I had a real problem to put up to them. I know that I can go to the National Park Service, the Forest Service, the Soil Conservation Service, or any of these other agencies and get any help that they can give me on any problem that I have. I hope they feel that they can come to the Biological Survey and do the same thing.

We have a problem in dealing with these other agencies, but it is our problem, not theirs. They are anxious to get the helpful information that we can give them; in fact, they swamp us with requests for such information. We haven't the personnel in the Biological Survey to meet half the requests that come to us for help from the other Federal agencies. That is true of the Forest Service, it is true of the Tennessee Valley Authority, of the Soil Conservation Service, the Park Service, and all the rest of them. I have a group of men in our Research Division that are working nights and Sundays and holidays to get out the information that these other agencies want for use in solving their special problems.

There is one place where we have difficulty. Commissioner Frank T. Bell, of the Bureau of Fisheries, has mentioned it briefly. That is, there should be in the Federal Government some way in which the conservation agencies would get a chance to present their case on flooding or drainage operations, mosquito control, and similar activities before rather than after the project has been completed and the damage from a wildlife standpoint an accomplished fact. There is no such mechanism at the present time.

Last week by accident only we learned, for instance, of a hearing that was being held by the War Department on a proposal to dig a drainage canal through the heart of one of our migratory waterfowl refuges, a canal intended so far as I could learn to help dispose of the sewage from a certain town. We weren't notified. We were not given any chance to present any facts on our side of the case. Because one of our men happened to hear about it accidently, we butted

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Elm trees in White Mountain National Forest, N. H.—the seeds and foliage provide food for wildlife. (Forest Service photo.)

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Clouds of smoke rolling up from a fire in the Flathead National Forest, Mont.—a crown fire travels fast and is difficult for wildlife to escape. (Forest Service photo.)

in and did present our side of the case. The point is that we were not given officially any chance to consider that proposal from the standpoint of its effect on valuable wildlife resources.

That is true in many other cases, and there certainly should be some way in which such projects—building of dams, flooding of areas, draining of areas, for any purpose whatsoever—might be referred to the Bureau of Fisheries and the Biological Survey before the work is done instead of having Government agencies that are vitally concerned find out about it accidentally or after the work has been completed.

Fourth, and in many ways the most important need of a national wildlife program to me, is the recognition of wildlife and its interests by land management agencies, both public and private. I know you will all agree (it has been stated here many times and I have never heard it challenged) that the future of wildlife in this country is absolutely tied to the land. There isn't any argument about that. The people who are managing and owning the land are those who will in the final analysis determine the fate of wildlife. We never can hope to own or control for wildlife use alone enough land to do more than furnish sanctuary and provide for something less than absolute extermination for the species. If we are to have an abundance of wildlife in this country it must be because we have sold its value and its importance to the people who own or control the land. Private landowners and the farmers are a tremendous factor in such a scheme. After we eliminate all the public lands that are owned by the various organizations—Federal, State, and local—still a great portion of the land of the United States is and will continue to be in private ownership.

We must provide some sort of mechanism for getting to the private landowner the story that we know to be true. This story must be concrete, not abstract. We can get up before a bunch of farmers and wave our arms at them just as long as we please and tell them how valuable wildlife is and how beautifully the birds sing, and how nice it is to have them around where you can see them, and yet fail to get these farmers to do anything about wildlife. These folks are practical folks; they have to earn a living; and they are busily engaged in doing it. Some of them—in fact a lot of them—are having a hard time. We have to show them what to do, how to do it, and what advantages there are going to be for them. And our demonstration has to be very concrete. These educational demonstration units that I mentioned are a step in that direction.

Yesterday morning on the program there were outlined in detail the various educational agencies available to promote such a program. They should all be tied into a program of selling to the people of this country the real values of wildlife. In addition to this, public-land management agencies can be and must be increasingly conscious of the value and of the needs of wildlife.

I have a little map here that I should like to call to your attention to illustrate this part of the discussion. You see four black squares drawn to scale on the map of the United States here. These represent the Federal land only, as we couldn't get accurate figures on State and other public lands in these classes. The largest represents the land administered for national forestry purposes. The

second largest represents the public land largely useful for grazing most of which is now or shortly will be under national administration from a grazing standpoint. The third in size represents the part that is under administration for national parks and monuments for their scenic and recreational value. The little one over here that you fellows in the back seats have to take a telescope to look at is what is actually under administration for wildlife purposes.

There isn't any hope, any possibility, or probably any need of special wildlife areas ever growing to the size of the two larger if the administrators of all public lands will take into consideration the value and needs of wildlife. Of these administrators the one that can come the nearest to making or breaking the wildlife interests is the Federal Forest Service, which has the largest opportunity to be of service in this movement and the greatest responsibility.

I have been on many of the national forests of this country and on their lands are now found, aside from the antelope, most of the remaining herds of big game in the United States. Of necessity the forests will continue to hold them or not hold them. The Forest Service will have to take care of the big game in this country, will have to provide the land for its use, to a very large extent if there is to be any big game. Many of our finest trout streams are on these national forests. Many of our best remaining populations of such species as blue grouse, ruffed grouse, and wild turkey, and many of the finest song birds, find their natural homes in these forests. Our fur bearers, what we have left of them—particularly the fisher, the marten, the wolverine, and the beaver, the best furs that we have—are very largely or entirely on the national forests.

I do not believe that the wildlife interests can ask or expect that these forest areas will now or ever in the future be administered solely or primarily from the viewpoint of wildlife needs. They are set aside for the preservation and production of forest products, and they will probably always be administered from that standpoint, but we can ask that increasing provision and consideration be given to wildlife problems and wildlife needs in the management of these lands.

There are great possibilities. I only need to mention the increasing herds of deer and elk on the western national forests to indicate what can be done in land management. With increasing interest, the foresters in charge of those areas, in cooperation with the States, have built up fine herds of deer and elk in some places. There are many other possibilities on the national forests. May I point out one or two: Marten, fisher, and wolverine are the three finest furs that we produce in this country. The remaining stocks of these animals are on the national forests, in the most inaccessible parts of them. There are not many of them, but by proper management this resource could be made to produce many hundreds of thousands of dollars, and we could replace to a large extent the furs that we now import from foreign countries.

Many miles of forest streams are ideal for beaver production. The food is there. The water is there. All that is lacking is the beaver. We know how to transplant these animals, and there is a planting program in effect on some of the forests of the West. We still need a proper method of protecting the animals and a proper method of harvesting the fur after an abundance has been built up. On this

very point, there is a fertile field for cooperation between the National Forest Service and the various State game commissions. Most of the difficulties in the way of increasing and bringing back the fur supply of these forests are difficulties that arise out of legal and administrative problems. They are not biological. The biological possibilities have already been demonstrated.

The next in importance to the forest lands are the remaining public-domain lands, approximately 140 million acres of them. Here the picture is not so clear from the wildlife standpoint. These lands, neglected and abused for years, are overgrazed and in many cases badly eroded. There are many complicating factors. I don't envy at all any man who has the job of working out the future of these public-domain lands. If they are to be of maximum use to the national welfare they must be restored, the original vegetation must be brought back, and they must then be managed for their highest value to the community.

In many cases the greatest value of the public domain is in grazing. Those who object to grazing on public lands should go out and study some of the conditions in the West. The use of these lands for grazing purpoaes is absolutely essential to the welfare of whole communities and whole counties. If it were not there, and if it were not used for that purpose, no one could live in the country. And I think the wildlife interests must concede that.

On the other hand this public domain is the natural habitat of all the remaining herds of antelope we have in this country. It is the natural home of the sage grouse, the largest of our native grouse, and it is also the natural home of many other beautiful and interesting game and other species. Accordingly, while we should recognize that the lands are chiefly valuable for grazing in many communities, we have a right to ask the livestock interests to remember that these are public lands, that the wildlife is also a public resource, and that on the public land it is right and proper that provision be made for the maintenance of these public wildlife resources.

I am very glad to state that some areas in the public domain have been set aside and others are in the process of being set aside in a way showing some recognition of the needs of wildlife. This is a real and a distinct gain for the wildlife interests. The thing that does disturb me somewhat is the tremendous furor of opposition that has been stirred up in certain Western States when we ask, not that livestock be excluded from the public domain, but that some reasonable provision be made for wildlife on these areas. I am sure that it doesn't represent the sentiment of the majority of the stock owners. I know too many stockmen who are interested in wildlife, and I know too many places where the only remaining wildlife in an area of this semiarid character is there because some stockman at his own expense has made a place for it on his own lands. Without the personal interest of some of these men many of the remaining herds of antelope would have long ago passed out of the picture. In many instances I can give names and places.

There is another side to the picture. If and when the overgrazing on these public lands is stopped and they are allowed to come back to their original cover of vegetation, there will be a chance for wildlife. Those lands can, and within my own memory did, carry many more head of livestock than they do at the present time and still

have game on them. If they can be brought back by regulated grazing to anywhere near their original condition, they can take care of the existing livestock herds and more too, and still provide adequately for the wildlife that we might want there.

I have used these two largest Federal land administrative agencies only as examples of what might be done in caring for wildlife. I do not believe that it is too much for the wildlife interests to ask that all public land administrative agents—Federal, State, or local—consider the needs of wildlife in handling their lands. Wildlife is declared by laws of all the States to be public property. It seems to me eminently fitting that public administrators of public lands should consider the needs of wildlife in their administrative programs.

The fifth point in any national program of wildlife restoration I am only going to mention. It has been brought up in special sessions of this Conference and mentioned by a number of people, and it concerns many interests in addition to the birds and animals for which I am speaking at the present time. That is the need of solving the problem of stream and lake pollution. Pollution does vitally affect the birds and animals, as well as fish and other interests. It threatens the very existence, in many parts of the country, of the aquatic vegetation, the small aquatic insects, the mollusks, and the crustaceans on which our waterfowl and water animals depend. It is of real interest to all of us. It is of course of vital interest to the fishermen and to those interested in using water for recreational purposes. In setting up any national program for wildlife restoration, doing something about this pollution problem is one of the real vital needs.

The sixth point in any national program, as I see it, is a program of adequate research. We already have much information that can be used in a wiser administration of our lands from a wildlife standpoint. We can improve the conditions on many of these lands without further research. We know many answers now that can be used, but any time a program of restoration is put into effect new problems will be created. There will be new difficulties to solve, and new angles will appear that no one ever dreamed of, and any national program must be based on facts, and on needs arising from constantly changing conditions. Things that we might know to be adequate only for the preservation and restoration of wildlife on an area, a few years from now with the changing industrial conditions in this country might be wholly inadequate or entirely outmoded.

The seventh need in any advancing national wildlife program is a recognition of the fact that no wildlife program can be complete without provision for protection of the animals or birds involved. From a biological standpoint there is only one basis on which regulations governing the taking or the protection of wildlife should be based, and that is on the needs of the species concerned, not on the desires of the sportsmen or any other group of people who might want to take them or use them for any purpose. From a biological standpoint there isn't any argument about it. If we do not preserve adequate stocks our wild species are on the way out. The only way to preserve breeeding stocks is to base regulations of the number or percentage of animals that may be taken on the needs of the species. That involves an understanding of the kind of pop-

ulation there is, and of how many can be taken and still leave a breeding stock to repopulate the area. I think that is becoming more widely recognized each year that passes.

State game commissions should have the power to close seasons, to regulate bag limits, and to enforce or promulgate any other regulations that they deem necessary in order to protect their breeding stocks of wildlife. There are still many States in which all regulations are made by legislatures, which may be in session only once in 2 years. Certain species of wildlife may meet with a sudden disaster which requires that something be done quickly. If all depends on action of the legislature, the remedy may be entirely too late. From a biological standpoint alone the administrative agencies responsible for the protection and perpetuation of these wildlife species should thus have the power to make flexible regulations—to close the season entirely, if necessary, to protect the breeding stock; and, on the other hand, to open seasons and increase bag limits in areas where there are surpluses that cannot be carried there permanently.

To summarize briefly, the seven needs for a national wildlife program, as I see them, are:

1. Land for the restoration and use of wildlife.
2. Closer cooperation between Federal and State administrative agencies on an educational and refuge program.
3. Closer coordination of Federal activities that may affect wildlife interests adversely or otherwise.
4. Recognition of wildlife values by land-management agencies, both public and private.
5. Doing something about pollution.
6. Adequate research program.
7. Protective regulations based on the needs of wildlife, entirely on the needs of wildlife.

I thank you. [Applause.]

Chairman BARKER. We have one more very important paper here this morning, folks, that I would like awfully well for all of you to hear from our neighbors on the north, and I am sure you would all enjoy hearing it and would profit by it.

Prof. G. E. Potter (Baylor University, Waco, Tex.), of the United States Bureau of Public Health, has a very important announcement he wishes to make.

ANNOUNCEMENT OF DR. G. E. POTTER

Dr. POTTER. I happen not to be in the United States Bureau of Public Health but I am authorized to represent them this morning. I am simply a professor in a Baptist university out in Texas.

Due to a slight technicality—perhaps some others of you have noticed it—we find that the United States Public Health Service has not taken part in this conference.

Dr. R. C. Williams, who is one of the Assistant Surgeons General of the United States Public Health Service, has given me permission and authorized me to announce that the Department which he represents is willing to cooperate with us in all things.

The reason I say that and the reason I became interested in it was because this Department is one of the oldest departments; it

dates back to the time of George Washington, perhaps before. I don't know the history of it, but that Department has the respect of the public all over the United States and its Territories. They can release one newspaper story and fix the minds of 95 percent of the population of this country in any direction that they might want, because they have the respect of the people. I would not want to let this conference go by, for my personal part, without we ourselves realizing that this is a Department of the Government with which we must have cooperation.

That Department controls almost absolutely, in its own name, such things as pollution problems. They control, also, the restoration of swamp lands; they can make mosquitoes awfully large if they choose to head off a project, or they can make them awfully small on the same little piece of land if they are with us in trying to do something about it, and we know it. They also control the matter of game disseminated diseases. There are a number of diseases that are spread from person to person and from animal to animal by certain of the small animals that we call game, when we think of them from our point of view.

This Department has this authority already invested in it—it wouldn't be a matter of our voting on whether they are going to do it or not. I bring to you the announcement from Dr. Williams that his Department will cooperate with us.

I don't know that it is necessary for us to go on record as doing anything about it because they don't expect that, but I thought our conference should know that this is the way that Department feels about it. [Applause.]

Mr. Seth Gordon. The chairman has asked me to announce that it is deemed best to hold the other speakers over to this afternoon.

We have arranged to transfer the meeting to the hotel, in the ball room, at 2 o'clock.

(The meeting adjourned at 12:15 o'clock.)

FRIDAY AFTERNOON SESSION, FEBRUARY 7, 1936

The final session was called to order at 2:15 p. m. by Mr. Seth Gordon.

Mr. Gordon. The chairman of the general conference committee is the chairman of the afternoon session. He opened the show and he is going to close it.

(Mr. F. A. Silcox took the chair.)

Remarks of Chairman F. A. Silcox

Chairman Silcox. We have an unfinished part of the program of yesterday afternoon. Mr. F. R. Carpenter, Director of the Grazing Service of the Department of the Interior, has jurisdiction over some 83,000,000 acres of land that fill a vital place in the whole problem of wildlife planning in the West. Mr. Carpenter, we are delighted to have you here with us. [Applause.]

Address of Mr. F. R. Carpenter, Director of Grazing

Mr. F. R. Carpenter. Thank you, Mr. Chairman.

When the Taylor Grazing Act was passed June 28, 1934, it contained a couple of references to the conservation of wildlife which

were rather general in nature and have been the subject of conjecture and some suspicion ever since.

The time has come now to answer the question of, What has the administration of the Taylor Act done for wildlife? In order to intelligently do so it is necessary to know a little of the background of the Taylor Act and situation of wildlife on the unreserved public domain prior to its enactment; also, the method of administering the act must be understood to judge its probable effect. I will try to give briefly these underlying data before coming back to the question at issue; and, after I have, I will try to make the answer in concrete instances of accomplishment which can be taken and judged by you for what they are worth. I will not indulge in opinions and hopeful guesses about the relation of this statute to wildlife.

The unreserved public domain in 1934 consisted of 165,000,000 acres of land; 95 percent of this land was in the 10 Western States of Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, and Wyoming. The location of the public lands is practically within the 15-inch isobyetal line which marks the rainfall as less than that amount. This great semiarid region totals nearly 600,000,000 acres of land and is therefore in area nearly one-third of the total continental United States which contains 1,900,000,000 acres. Half of all this region in the 10 States is still federally owned, being roughly 150,000,000 acres in forests, 165,000,000 acres public domain, 70,000,000 acres Indian reservations, 7,000,000 acres national parks and monuments.

You will realize at once that the Federal Government is in this picture as the great dominant landlord in addition to being in the picture as a governing agency.

Now as to the status of wildlife prior to the passage of the Taylor Act, I will use the figures compiled by the national forests for a 10-year survey period prior to 1934 and will summarize the facts as follows:

Big game in the 10 Western public land States

	Acres
Absolute game sanctuaries, hunting prohibited:	
64 national parks and monuments (no grazing)	6,093,000
100 national forest areas (no grazing)	2,895,949
10 biological survey areas (no grazing)	1,018,883
255 national forest areas (grazing restricted to 55 percent capacity	19,407,083
Total	29,477,915
State game refuges:	
Restricted hunting; grazing unrestricted	32,089,000
Grand Total	61,566,915

The above cooperative procedure has resulted in an increase in big game on the national forests in the period from 1921–32 as follows:

	Total number
Deer, 109 percent	946,546
Elk, 97 percent	103,856
Mountain goats, 117 percent	21,736
Mountain sheep, decrease 10 percent	12,505
Antelope in the country at large, 100 percent	46,200
Antelope in the national forests, 458 percent	-------

Domestic livestock has been reduced 14 percent.

You will note from this that big game with the exception of mountain sheep was decidedly on the increase.

After the passage of the Taylor Act allowing 80,000,000 acres of public domain to be formed into grazing districts, 34 such districts were set up, scattered around in those 10 Western States. Each of these districts contains public and private land which make them average about the same size as the State of Connecticut. So it is fair to say that we now have under administration 34 tracts the size of Connecticut scattered throughout this region.

Prior to the establishment of these districts, through the efforts of Mr. J. N. Darling, then Chief of the Biological Survey, and in addition to the sanctuaries and refuges already existing, there were designated 10 great hereditary ranges for wildlife aggregating in extent some 10,000,000 acres of land. These areas were set aside for the primary preservation of the hereditary ranges of mountain sheep, deer, buffalo, antelope, grouse, sage chicken, and other native wildlife species. The ranges they inhabited were to be left for common grazing of domestic livestock as well as wildlife, provided the wildlife were to have a first consideration up to an agreed maximum number in each case. In determining upon that maximum number Mr. Darling went to Salt Lake City, Utah, last May and there met with committees of the inhabitants and stockmen from all of the 10 great areas set aside as game refuges. In the conferences which followed the fact was clearly brought out that not only were the stockmen of these regions almost unanimously in favor of a reasonable protection of wildlife but also that in many cases, by reason of the control of the water by stockmen and much of the most desirable feed, wildlife would long ago have become extinct except for the unaided efforts of the stockmen. For instance, in the House Rock Valley, in Arizona, one ranchman controlled all the water and had been maintaining 200 head of buffalo and furnishing both water and whatever feed did not come from the public domain. There are a great many other cases of this kind.

The meeting between Mr. Darling and the stockman was to my mind historical in the establishment of a mutual respect for a sane policy of conserving wildlife on the public domain.

Now let me touch another phase which has great possibilities and which has come into operation within the past year. I refer to the so-called New Mexico plan whereby a balanced use of public ranges by domestic and wildlife is sought through the creation of a State committee known as the State land committee, which is a subcommittee of the State planning committee under the National Natural Resources Committee. On this board both domestic livestockmen and wildlife societies are represented but neither is in a majority. The State university, State fish and game commission, and other interested agencies are also represented.

In New Mexico this committee appoints a representative of wildlife to sit on each of the boards of district advisers in the five grazing districts of that State to assist in working out a real program of wildlife protection.

The Secretary of the Interior has officially approved this plan and it is now a part of the Department's policy in this regard.

I wish to urge its study by citizens of other States similarly situated for I believe it gives a sane method of approach to a difficult problem.

Under the New Mexico plan in each of the five grazing districts in New Mexico there is now an official representative of wildlife and in such high regard are they held by the stockmen that in one district the official wildlife representative has been made chairman of the entire board.

In the State of Oregon this plan of operation has been carried on by the newly appointed State land use committee which is a subcommittee of the State planning committee and it is meeting and solving the various wildlife problems of that State on the public domain in a manner similar to New Mexico.

The door is open for any State containing grazing districts to have a subcommittee of the State planning committee to be known as a land use committee to act as in a similar manner. The New Mexico plan may not exactly suit conditions in other States, but the principle remains the same and is open to any and all States, to wit, to have a commttee on which neither wildlife nor domestic livestock is in a majority which shall make recommendations to the Secretary of the Interior for the conservation of wildlife.

The New Mexico plan of game management is a demonstration of how far the Secretary of the Interior is willing to go in fostering such movements.

It is too early yet to see what the result will be of these two great steps which have been inaugurated since the Taylor Act was passed, but I cannot refrain from reading you parts of a letter dated January 22, 1936, which I received from Mr. Nic Wents, one of the leaders of the oldest grazing district in the United States which was formed in 1928 by special statute and is known as the Mizpah-Pumpkin Creek grazing district:

> At time district was organized (1926) we had 23 antelope.
>
> Six years later we estimated about 250. Undoubtedly some of the 250 drifted into our district from unprotected areas.
>
> We deputized (game warden and sheriff) our range rider not only as a protection to wildlife but also as a protection against slaughter of beef. Being a deputy, our rider had the right to search cars. After a few cars were searched the word went around that we were keeping close watch on what was going on in the district. This stopped hunting out of season, and butchering of beef also.
>
> The members of our association take as much pride in the wildlife of our district as they do in their domestic stock.

From this brief account I trust that you can see the possibilities which regulated use of the public domain offers for true conservation of wildlife and also I trust you can discern what I have found to be universally true, that the most intelligent and interested group for true conservation of wildlife in this great semiarid region is the stockmen inhabitants themselves. My experience with them has proved to me, and I believe my friend, Mr. Darling, will bear me out in this, that when they are met in a fair spirit of compromise they become the most effective and enthusiastic game conservationists in the country. [Applause.]

Chairman SILCOX. Mr. Carpenter, we are particularly appreciative of your presentation of that whole western situation. It has been

a great battleground between those who are vitally interested in wildlife and the stockmen who occupy those areas and who are vitally concerned with using those areas in order to maintain their whole social structure.

I would like to break into the program for a moment or two to find out if there is present at this time a representative of the Wool Growers' Association. I know I am springing this on you, but will you be good enough to step to the platform and make a statement to the audience? We have tried to provide an opportunity for some of the stockmen who are here to state to us their particular side of this matter.

A Statement by the National Wool Growers Association With Relation to the Wildlife Question

The seventy-first annual convention of the National Wool Growers Association at Salt Lake City, Utah, January 22–24, 1936, expressed its attitude toward the wildlife problem in the following resolution:

"Whereas it is the earnest desire of all forward-looking citizens to provide for proper land use and the conservation and wise use of our natural resources;

"Whereas there is a continuing disagreement, sometimes reaching acrimonious proportions, between the range livestock interests and the wildlife interests in the Western States; and

"Whereas the contentions undoubtedly will continue until or unless sound, basic, factual information dealing with both the scientific and practical phases of wildlife and range management is secured: Therefore be it

"*Resolved*, That we, the National Wool Growers Association, in convention assembled this 24th day of January 1936, strongly urge that the wildlife conference called by the President of the United States for the development of a tentative program for the conservation and restoration of wildlife resources and held in the city of Washington, February 3–7, 1936, strongly recommends that provision be made by the Federal Government, in cooperation with State agencies, to make necessary surveys, secure and compile scientific and practical data, as will permit the proper evaluation of our wildlife resources and our range livestock industries, and will also indicate the proper place of each in the social and economic welfare of the country as a whole.

"We urge the membership of the National Wool Growers Association to cooperate in every reasonable manner in assisting in the making of this investigation and study."

The National Wool Growers Association takes the position that to deal with the wildlife problems of the country there should be a weighing of all facts and a thorough study of the place that wildlife and domestic livestock have in the economic structure.

To quote further from the platform of the above-mentioned National Wool Growers' convention, "Some of the literature published and claims made have, we feel, not been based upon full understanding of the facts or complete appreciation of the social and economic welfare of the communities connected with these lands. We ask the

true friends of the wildlife and game-conservation movement to endeavor to combat misleading propaganda and to aid the public in obtaining a fair view of the just claims and interests of the livestock industry so far as it must be connected with the general land areas upon which much of the game can and should be maintained."

It cannot be fairly denied that the range livestock industry is a tremendously important factor in the affairs of the western half of the United States and that any properly directed program looking to the adjustment of the uses of the range areas of this country must take into consideration those persons whose investments are identified with range uses.

In dealing with regional problems in agricultural adjustment as considered by the Program Planning Division of the Agricultural Adjustment Administration for 1935 the point is made that "the only important agricultural use that can be made of the land, therefore, is for grazing. There are practically no alternatives to grazing, and it is necessary that even grazing be carried on on an extensive scale, since grazing land over a large part of the region has only a small fraction of the carrying capacity of grazing in the Corn Belt."

Further, in connection with this analysis, we read: "The range livestock regions contribute materially to the Nation's meat supply. Of the total cattle on farms reported in the 1930 census 13 percent were located in this region. About 37 percent of the cows kept for beef production were reported as in this area and 44 percent of the sheep and lambs."

While it is true that less than half of the total area in the range livestock region is privately owned, the fact should not be overlooked that much of the remainder of the area that is under private ownership is directly or indirectly dependent upon the public ranges for its economic security. These lands appear upon the tax rolls of the respective States and thereby provide for the maintenance of government prevailing therein. To further reduce the grazing of livestock in the West would seriously curtail all types of business endeavor where so much of commerce is dependent upon range use by domestic livestock. To deprive the stockman of his summer range, much of which is public land, would be to destroy the usefulness of his ranch properties which are definitely dependent thereon.

It is true that the livestock industry counts among its membership a few individuals devoid of the proper conception of wildlife and its place in the affairs of the country. On the other hand, the widespread misuse of figures and opinions by certain wildlife conservationists brand them as being badly out of step with the thinking of the rank and file of the citizens of this country.

Organized wool growers are doing everything possible to put their own house in order, and substantial progress has been made to the end that there is a willingness to cooperate most fully in any study that will correctly appraise the values and proper places of wildlife and domestic animals in the utilization of public resources. The great majority of livestock owners of the West is not in the least fearful of the findings which would come from such survey based upon fact, and are only hopeful that an enterprise of that character may be launched to the end that there may be fair settlement of a

problem that has long aggravated relationships between wildlife interests and livestock producers.

Chairman SILCOX. I think we are very fortunate in having a representative of the Wool Growers' Association here with us. I attended their meeting at Salt Lake, and for the benefit of the group here, there was a very liberal resolution passed by their national assembly which offered the opportunity for the cooperative approach to this whole problem of utilization of these ranges for the protection and development of wildlife.

I shall make bold to ask whether there is a representative of the Cattle Growers' Association here. If there is not, we will proceed with the program.

Mr. Robert Marshall, of the Indian Service, has agreed to substitute for Mr. Collier, whose name is on the program, and will represent the Commissioner of the Bureau of Indian Affairs here in Washington.

ADDRESS OF MR. ROBERT MARSHALL, OF THE UNITED STATES INDIAN SERVICE

Mr. ROBERT MARSHALL. Mr. Chairman, I suppose the place to begin is that hardly a month goes by but that there comes into the office of the Indian Service some ferocious letter from some very sincere and earnest and honest conservationist who wants to burn or boil in oil or perhaps string to the nearest telegraph post the whole Indian Service for their failure to administer the game laws on different Indian reservations. These criticisms are very welcome, they are fine; any Government employee ought to welcome criticism; in fact, he generally is lonesome without criticism. That is all very fine and I am not going to try to stand up here and cite to you a list of Indian reservations where we do have some sort of game regulation, and neither am I going to tell you or count for you, in spite of the slaughter of the wildlife on Indian reservations, the number of antelope or golden eagles or perhaps Gila monsters that we have got on our different reservations, because I would like to get something really constructive from you, probably not at this meeting because there isn't going to be time for discussion, but those of you who are interested may take the interest to write to us or come and visit us and tell us what we might do that you would suggest to help solve this very difficult problem of wildlife management on Indian reservations.

In my talk today I am going to try to trace for you what seem to me to be the causes which have changed the Indians in about three centuries from a group of game conservers to, on the whole, a group which do kill the wildlife pretty heavily, and I am going to tell you what seem to me to be the causes for this, and also what seem to me to be the remedies, and maybe some of you will be able to help out with additional suggestions or criticisms, which are always interesting.

The Indians, before the advent of the white man, were generally considerate of the wildlife, on which so much of their livelihood depended. They apparently did not slaughter needlessly. There is ample evidence in the literature of men like Catlin and others who

visited the Indians in the early days, that the Indians had very stringent rules in many tribes actually about not wasting game. They even practiced cropping among beaver and muskrats in certain conditions, and as a result of the fact that there weren't many Indians living on this continent at that time compared to the vast area, there doesn't seem to be any evidence of serious game depletion or any game depletion at all from the Indians. In fact, the amount of wildlife that was killed by disease or by the predators from among the wildlife community was no doubt much greater than the amount that was actually killed by the Indians.

Therefore, it appears that in spite of notable game cycles and local migrations, all in all the increase and the decrease among the wildlife in the days before Columbus were very well balanced, and there appears to have been a very nice equilibrium in the North American wildlife in those days.

But then came the white man. At first the tiny settlements of the white immigrants had very little influence on the wildlife of the country except immediately adjacent to those settlements, but gradually the settlements kept spreading out until at the close of the American Revolution much of the country east of the Appalachian Divide had had the normal game relationship seriously affected. After the close of the Revolution this upsetting process kept spreading westward until by the close of the nineteenth century there was hardly a portion of the North American Continent, except way up in the Arctic regions, which didn't have its normal game relationships seriously upset.

All the while that white settlements were expanding on this continent, the Indian reservations conversely were being restricted. At the time of the landing of the Pilgrims in 1620, the Indians of course had all of what is now the United States to spread out over, 1,903,000,000 acres, apparently, and thereafter that area kept being diminished gradually until by 1934 when the Indian Reorganization Act was passed which stopped the dissipation of Indian lands, the 1,903,000,000 acres had shrunk to only 48,000,000 acres, or about a fortieth part of what the Indians had had prior to the advent of the white race. In that same time the Indian population shrunk about in half, but that still left a per capita area for Indians about one-twentieth of what it was before the days of the white race.

Now, the Indians who had made their livelihood economically largely through hunting and fishing were obviously very seriously affected when they had only a twentieth of their resources to depend on, and the white man in cutting their area down to a twentieth part of what it had been did not make any commensurate adjustment. Oh, it is true they gave the Indians a few gristmills and a few blacksmiths to teach them how to shoe horses, and a few yoke of oxen and things like that, but nothing to compensate for the fact that 19 out of every 20 acres that the Indians had previously had, had been taken away from them.

Of this land that was left to them, about half constitutes about the poorest quality land that is left in the United States, of a desert or semidesert type, and in fact there are several hundred thousand acres in Indian reservations in which it would take a square mile to support a cow for a year. In view of this cramping of the Indians'

resources it was therefore natural that they would try to go after whatever they could and make their livelihood out of everything they could lay their hands on.

All the while that the Indian lands were being thus restricted, the Indians saw the white man all around them hunting, in most cases without much restriction, wildlife which the Indians had considered their own from time immemorial; they saw the white hunters in a few decades wipe out the buffalo which had formerly flourished everywhere over the plains; they saw white hunters shoot the elk by the tens of thousands and leave their carcasses rotting in the forest simply for the sake of their teeth; they saw the early frontiersmen in many cases shoot animals merely for the choice cut of meat and not to utilize the whole animal as the Indians had done prior to the advent of the white race. In short, the white man taught by inspiring demonstration the art of destructiveness, and the Indian pupils in many cases, I admit, surpassed their white teachers in destructiveness after that example was taught.

As a result of that, we find, as I said before, great indignation among sincere conservationists who do not like to see the slaughter that has gone on, we admit, on a good many Indian reservations. So we find somebody like Mr. Barker yesterday protesting that the Indian Service should go in and forcibly stop the Indians from hunting on their reservations. Now as a matter of fact, even if it were desirable to compel the Indians, who in many cases actually need their wildlife for food, to stop hunting on their inadequate lands—and I won't argue the desirability—and even if it were possible from a physical standpoint forcibly to prohibit the Indians from hunting on their own reservations any more than it was possible to prohibit the white man from drinking whisky during prohibition days, even if that were possible we don't have the legal authority to do it. That is a thing which is often entirely misunderstood, I think, and is really at the basis of the wildlife problem on Indian reservations. The Indians on most reservations have treaties, and, if not, have Executive order and congressional reservations on which State game laws are legally absolutely inapplicable. Furthermore, the Indian Reorganization Act of 1934, which did provide for laying down regulations for all Federal lands, provides absolutely no penalties or no methods of enforcement, so that while we could tell the Indians, "You cannot hunt grouse at such and such a season and you cannot shoot deer except buck with horns 3 inches long", and so on, there is absolutely nothing we can do legally to an Indian who hunts them, there is absolutely no way of enforcing them. We have to look to other means of enforcing game regulations on Indian reservations.

The Government has for years and years urged the Indians to conserve their wildlife for the sake of their children and their grandchildren and I guess also their great-grandchildren; very carefully prepared arguments have been presented to them which anybody ought to be convinced by, but the trouble is that they haven't convinced anybody, and the total effect has been nil. The reason the Indians have not been convinced to enforce game laws, logically, on the basis of reason, it seems to me, falls chiefly into three parts. In the first place, it is genuinely true that the Indians

have been hungry, that they haven't had enough food to support themselves, and that has been because of the points I have mentioned, that they have had their land area reduced to such an extent that they can't earn their livelihood by the ordinary means; and I think it can be regarded as axiomatic that when people are hungry food always takes precedence over conservation. In the second place, the Indians have lost practically all of their olden rights which they had except the right to hunt and trap and fish at will on their lands, and constantly when you talk to the Indians and try and urge them to give up some of these old treaty rights to regulate their wildlife, you hear them saying, "But the white man has taken away every other right we have. This is the one right we have left and we don't want to give this up too." In fact, we might say that the freedom to hunt and shoot and trap and fish without any interference has become to many Indian tribes a symbol of all their rights and all their liberties which they sacrificed to the white man in the past; the liberty of their own education, of their own religion; the liberty to handle their own lands and their own resources have all been given up, and all the Indians still have, to them it seems anyway, is the right to regulate their own wildlife.

The third point has been that the Indians in the past have genuinely been double-crossed so many times by the white man who asked them to make agreements and after they had made the agreements it turned out that these agreements didn't mean at all what the Indians thought they meant, that they have become very suspicious of the white man and any agreement that the white man asks them to make, and they are going to look into that sort of thing very carefully, because there are many cases where the Indians made what seemed to them very innocent agreements and they discovered after they went into effect that they lost half of their reservations, or something like that.

Those are three genuine obstacles in the way of game enforcement on Indian reservations, and yet I don't believe that the situation is hopeless at all in spite of these obstacles, but I think we have got to recognize these obstacles and find the way around them.

I would like to suggest two major points which are necessary for these limitations of wildlife management on Indian reservations to be overcome. It means the adoption of two new principles in the treatment of the Indians on their reservations, two principles which are basic to the New Deal Indian policy and the new Indian Reorganization Act which was passed in 1934. These two basic principles of the new Indian policy are: (1) That the Indians should be given the economic possibility of earning their own livelihood. By this Indian Reorganization Act it was provided, in the first place, that the Indians couldn't sell any more of their land, and the sale of Indian land in the past had cut the Indian resources about two-thirds in the brief space of 50 years. That has been stopped and has given the Indian a chance to earn a living. In addition, loans have been made to help the Indians to go into economic activities which will make it possible for them to earn their own livelihood instead of having to depend upon inadequate lease returns and inadequate rations and special relief money which the Government has given

out. Therefore, the Indians are now going into agricultural practice actively, the livestock associations among the Indians are increasing tremendously, the Indians are planning to go into certain sawmill and lumber producing operations on certain reservations, and the arts and crafts development among the Indians is being very much boosted. It is our feeling that when the Indians have a better economic basis for their life they will then consider very much more seriously reasonable hunting and fishing and trapping restrictions.

The second major tenet of the new Indian policy is to give the Indians increasing self-government, not to give them self-government all of a sudden, but gradually give them more and more of it, and it is our feeling—and it is more than a feeling, we feel very strongly convinced of it—that as the Indians get more rights, as they are able to decide other things merely than the hunting and fishing and trapping on their reservations, then the right to hunt and fish and trap in perfect freedom will stop being a symbol of all the rights they have lost, and they will use the same logic and the same judgment to regulate their hunting and fishing and trapping that they are already beginning to use on many reservations in other things which have been turned over to them for their own determination.

The proof of how this theory will work has been shown on the Crow Reservation where the Indians have a much higher economic standard of living than on most reservations and where they have taken over managing a good many of their own affairs. The Indians there voluntarily imposed upon themselves a 3-year closed season on all wildlife on their reservation, and today, 15 months since this was put into effect, there has been only one case that has come to the attention of anyone of any illegal hunting, and the man who did that came down to the superintendent and confessed having killed one elk illegally. At the same time, under the leadership of Robert Yellowtail, the Crow Indian superintendent of the Crow Reservation, and with the generous cooperation of the Park Service, some 214 bisons and 270 elk from the excess herds of Yellowstone Park have been liberated on the Crow Reservation, and the Crow Indians are taking an interest in that thing, a tremendous, vital interest in the preservation of that wildlife. It has become an emotional point with them that this wildlife shouldn't be destroyed, and that is because they met those points which I have made.

The Indians have the intelligence to impose upon themselves the necessary restraint in hunting, trapping, and fishing, provided their economic needs are taken care of. The solution of the Indian wildlife problem lies not in the compulsory enforcement of the white man's restrictions, but in a better means of livelihood and more self-government. [Applause.]

Chairman SILCOX. I think we are particularly indebted to Mr. Marshall for a rather illuminating, democratic approach to a problem which has been long, long neglected, a problem which is greatly misunderstood, and I think without the enlightening, emotional, and historical background that he has given of the Indian's point of view, the problem would be very difficult of solution. I think we want to express our particular appreciation for a talk so illuminat-

269041

A, Planting 8-inch trout in Rocky Row Run, George Washington National Forest, Va. (Forest Service photo.)

309354

B, Stream improvement in Allegheny National Forest, Pa. (Forest Service photo.)

288748

A, Fish-stream improvement dams built by C. C. C. workers in Polica Canyon, Santa Fe National Forest, N. Mex. (Forest Service photo.)

15489A

B, Mixed stands of hardwood trees in Pisgah National Forest, N. C. Good undergrowth makes valuable deer range. (Forest Service photo.)

ing and so constructive, and one that lends hope that a problem of that kind can be met if it is not taken head-on and if we approach it through proper constructive channels.

We are fortunate to have Mr. T. R. Loftus MacInnes, a representative of the Indian Affairs Department of Canada, with us, and he is going to speak to us now on the Indian situation in his country.

Remarks of Mr. T. R. L. MacInnes, of the Indian Affairs Department of Canada

Mr. T. R. L. MacInnes (Ottawa, Canada). Mr. Chairman, ladies, and gentlemen. My remarks will be of an informal kind because really they are supplemetary to those that have been given by Mr. Marshall. I was rather surprised when I read his paper, of which he was good enough to give me an advance copy before today, to find that our problems were so very similar in the two countries. In Canada, as in the United States, I think, all the Indians are wards of the Federal Government, or, as it is usually called, the Dominion Government. Game and fish administration, on the other hand, is within the jurisdiction of the Provincial governments which correspond to State governments in this country. Therefore, there is a divided jurisdiction in dealing with the problems of the hunting and fishing Indians—Federal jurisdiction over the Indians and Provincial jurisdiction over the game and fish.

In Canada we have been very much concerned of late years with regard to the affairs of the hunting and fishing Indians, because, as Mr. Marshall has explained in regard to your own country, white trappers have been coming in increasing numbers into Indian hunting grounds. By that I don't mean Indian reserves. In Canada all our Indians, as in the United States, live on reserves that are spread very evenly across the Dominion. These are residential reserves, they are small, they don't involve such large tracts of land as you have in the United States for Indians, because although your population of Indians is estimated at about three and a half times ours—about three hundred and ninety to four hundred thousand I think you have, as compared with about 112,000 in Canada—you have some 50,000,000 acres of Indian reserve lands, whereas we have only about 5,000,000 acres.

Mr. Marshall has mentioned that much of the land occupied by or held in the name of your Indians in the United States is not productive land. With us in Canada the amount of land, although less, is picked land, much of it agricultural and well settled, the hunting and fur thereon being in consequence almost negligible.

The Indians have been hunting in the northern open Crown lands, as we call them; that is unorganized State domain, as you would call it here. It is in these areas that we have come to the assistance of the Indian hunters and trappers. By immemorial usage they were conservationists. As a matter of fact, it is very interesting to find how they went about it before the white man ever came to the country at all. They actually had the whole area in northern Quebec and northern Ontario mapped out by families. One family would have a trap line that would extend through a certain valley, and the neighboring family respected that, and so on. That old

economic hunting culture of theirs, or hunting political or land tenure system, which was really about the extent of their organization, was all they needed in the way of land ownership because they only used the lands for hunting purposes and fishing; but that has all been upset by white people coming in and we have had to take steps to correct the situation, because, while the Indian used to conserve the game in those lands in the old days, now, when he finds white men, very often Finns or other people who are comparative strangers in our country and not citizens at all, coming in and practically mining off the furs, trapping everything, he naturally is going to do the same thing. He will take all he can while he can, whereas in the old days he would have had two or three trap lines and he would have followed a sort of rotation of crops system; he would leave, say, two of those lines unused for a certain number of years for replenishment; only using one at a time. But with the white man coming in and exterminating the fur wherever he could find it, the Indian would start to do the same thing and we would be faced with the problem of the extinction of many valuable species.

There is one thing in particular I would like to mention about the Indian hunter; he is not a poisoner. The white trapper, especially the Finn, uses poison extensively. That is a very vicious practice which weeds the fur out of an area in a short period. We have never found a single case on record of any Indian using poison. They really abhor it.

By cooperation between the Dominion and the provincial authorities who, as I explained to you, control the game and fish, certain large game preserves have been set aside for Indians in which only Indians may hunt. That doesn't mean that those are Indian reservations in the sense of Indian lands here; they have no title in those preserves, but merely the exclusive right to hunt and fish there under supervision.

In the Province of Quebec, the whole of New Quebec is set aside in that way. That is the entire district of Ungava, that very large shield-shaped part of the map that you see to the east of the Hudson Bay; it is a triangle about 1,000 miles to each side. That is an enormous game preserve. I suppose there is no reserve land as large as that anywhere in the world where everyone is kept out except the natives. I was asked this afternoon by a gentleman here how it was possible to keep people out of a huge area like that. I have a map here that will show it to you. If you can see that area marked "Indian hunting preserves", that is an area in which no white trappers can come any more, but only Indians. This area up here marked "9" (referring to Indian Treaty No. 9 in Northern Ontario) is in practically the same category. We succeeded in having all but a few bona fide resident whites who have had privileges there for some years, shut out. So that whole area, the whole round of the Hudson Bay and James Bay, has now become virtually an Indian hunting preserve. Intruders are dealt with by the Royal Canadian Mounted Police.

We are following similar plans elsewhere in Canada. All this territory up here, the Arctic islands, is practically set aside with the exception of the commercial route down the Mackenzie River, for Indians and Eskimos only.

In that way Canada is endeavoring to save what is left of the wild fur from the exploitation of fur miners, and at the same time under proper supervision to assure to the Indian at least some happy hunting grounds in a land that was once his own.

I was rather struck with what Mr. Marshall said regarding the Indians looking a little askance upon any proposal to further restrict such rights as they may have by treaties. Our Indians in Canada in certain areas have similar treaty rights, and great pressure has been brought to bear on the Government from time to time by organizations, sportsmen's organizations and others interested, to have these treaty rights abrogated or canceled, but you can't do that. After all, a treaty is a treaty and a Government's word is its bond; the Canadian Government is in the same position as the Government of the United States. It is a contract and it must either be lived up to or dishonored, and we are not going to dishonor a contract. However, in our later treaties with the Indians when we had become aware of the situations that might arise in regard to game and the need for conservation, we always put a proviso that such rights as the Indians might have would be subject to regulation so that closed seasons could be enforced. That provision, however, is not in some of the older treaties and it gives us a lot of trouble, because naturally it wouldn't do to allow the Indians to slaughter all the game, even though they might have the right to do so. But as Mr. Marshall has said, they look askance at any proposal to sign any new agreement. They are a little doubtful about any kind of a new deal. They feel that it might turn out to be only a new steal. [Laughter.]

I think sometimes with the exception of groups of people like ourselves who have some interest in bringing us into touch with the lives of the Indians, many forget that we have any Indians left on this North American Continent. I was giving an address one time to a meeting, and before it started a gentleman who was present, a quite prominent business man, hearing that I was from the Department of Indian Affairs, came up to me and said, "You are from the Department of Indian Affairs, Mr. MacInnes?"

I said, "Yes."

"Oh, indeed. I see by the papers that that man Gandhi has been giving your department a lot of trouble lately." [Laughter.]

It really isn't fair to the Indians, who once had this whole continent, to be forgotten altogether like that. Both the sportsmen and the public in general should remember that there are Indians, that they are human beings, and in regard to the game and fish and fur question, that the Indian really is dependent upon these things for his livelihood.

The sportsman has a great interest in the game and fish. It is an interest of pleasure and recreation, and so it should be, but with the Indian it is a case of actual survival, so you musn't be surprised if he is not anxious to give away any prerogatives or privileges that he now has in that regard. The situation is very much the same on both sides of the line in regard to the Indians.

I know that it has been very helpful for me to be here and hear Mr. Marshall's paper and to see what your policy is in regard to your Indian administration. I have in mind that as a result of this conference we may be able to do something along the lines of con-

servation among our Indians. We have some 400 Indian schools in Canada, and I don't see why we shouldn't put on the curriculum of those schools some instruction in regard to conservation along the lines mentioned the other morning when Mr. Darling and others were speaking to the convention.

I had a prepared paper, Mr. Chairman, but I decided that much of it would simply be a duplication of what Mr. Marshall had given, and so I will leave it with you to form a part of the record, and if there are any here who are interested in the affairs of the Canadian Indians, I shall be very pleased if they will come and speak to me and I will answer any questions insofar as I am able. [Applause.]

What Canada is Doing for the Hunting Indians

(Prepared for the North American Wildlife Conference, Washington, by T. R. L. MacInnes, Department of Indian Affairs, Ottawa, Canada)

In Canada, under the constitution, which is the British North America Act of 1867, all the Indians are wards of the Federal Government and Indian administration is conducted by a Federal Department—the Department of Indian Affairs.

The Indian population is approximately 112,000, spread fairly evenly across the Dominion and located on reserves as in the United States.

About 50,000 are dependent, in whole or in part, upon hunting and fishing for their livelihood. As might be expected, the hunting and fishing Indians are those who inhabit the less settled, northern, and outlying regions. They are the more primitive Indians in whom Indian blood still predominates who continue to follow the Indian mode of life, and who in consequence are more in need of Government supervision than the tribes who inhabit the more organized districts and have intermarried with whites and are more advanced.

Under the British North America Act, the game and fish belong to the Provinces, except, of course, in the few remaining Federal Territories. The problems that arise, therefore, fall into two jurisdictions—Federal, over the Indians, and Provincial, over the game and fish. Difficulties are overcome by conference and agreement between the Federal and Provincial authorities. In some parts of the Dominion Indians possess special hunting and fishing privileges, pursuant to treaties made with the tribes by the Crown.

Of late years the affairs of the hunting and fishing Indians have become a matter of grave concern to the department. Hunting and fishing are the aboriginal vocations of the primitive Indians. By immemorial usage the Indians were conservationists and still may be henceforward if protected. On the other hand, if whites are allowed to deplete Indian hunting grounds, the Indians themselves will naturally take all they can, while they can, and there is grave danger that such a situation may bring about intensive competition between whites and Indians, ending in the virtual extermination of valuable species. Indian families, in most cases, are permanent residents, and their hunting grounds are recognized among themselves and handed down from one generation to another, whereas white trappers are frequently of the itinerant class, whose practice is to trap out an area and then move elsewhere.

During recent years there has been an alarming increase in the number of white trappers who are encroaching upon hunting grounds in the northern parts of the various Provinces, which were formerly used by Indians only. White trappers are using poison extensively, and this illegal and vicious practice is becoming a serious menace to game conservation. Not a single instance of the use of poison by any Indian trapper anywhere in Canada has ever come to the attention of the department. It became apparent that failing special protection the Indian trappers in the northern regions would become destitute and indigent owing to the depletion of the game.

In the opinion of the department, the only satisfactory solution of these problems is to set aside adequate areas in which Indians only shall be allowed to hunt.

As a result of close cooperation between the department and the Provinces and the Federal authorities administering the northwest territories, great headway has been made in recent years by way of setting aside Indian hunting preserves with beneficial results both to the Indians and conservation.

A brief summary of the situation with regard to the hunting and fishing Indians in the various Provinces and Territories is as follows:

PRINCE EDWARD ISLAND, NOVA SCOTIA, AND NEW BRUNSWICK

Indians in the maritime Provinces are in the same position as other people under the provincial game laws and enjoy no special privileges in respect thereto. Some of the Indians claim that they should be exempt from provincial game laws pursuant to certain old treaties dating back to the time of George III, but the courts have not upheld this claim.

QUEBEC

An order of the lieutenant governor in council, dated January 16, 1932, provides as follows:

> Therefore the Honourable the Minister recommends that, in virtue of paragraph 6 of article 48, chapter 96 of the Revised Statutes (1925) the District of Mistassini, the unorganized part of the District of Abitibi, that of Ashuanipi, and also the whole of New Quebec, be established as a Fish and Game Reserve, where Indians only may carry on hunting for fur-bearing animals.

The order refers to the above-mentioned areas as "the whole of the north region of the Province", and approximates what was formerly the Territory of Ungava.

By a previous order in council, an area of approximately 4,000 square miles known as the Abitibi Game Preserve, and an area of approximately 6,300 square miles known as the Grand Lake Victoria Game Preserve, were set aside in like manner for the benefit of the Indians living in the vicinity of Grand Lake Victoria.

ONTARIO

There is a tripartite division of the Province for game administration as follows:

The eastern section.—All territory lying east of the French and Mattawa Rivers;

The central section.—All territory from the French and Mattawa Rivers to the Manitoba boundary and south of the Canadian National Railways;

The northern section.—All territory lying north of the main line of the Canadian National Railways.

As far as possible it is the object to retain the northern section for the Indians living in that area and other residents living north of the Grand Trunk Pacific Railway line that would be eligible for the same privilege as granted to Treaty Indians and half-breeds, with the understanding, however, that as far as the white trappers are concerned their trapping grounds will be limited to a certain given area in close proximity to their respective homes.

In the eastern section the Indians are subject to the provincial game laws in the same manner as other people.

In the central and northern sections, trapping licenses are issued only by officers of the Game and Fisheries Department for specified areas. In the central section the officers of the Province cooperate with the Indian agents with a view to seeing that Indian hunting grounds are not interfered with by other licenses.

MANITOBA, SASKATCHEWAN, AND ALBERTA

Under the agreement for the transfer of the natural resources to the Provinces of Manitoba, Saskatchewan, and Alberta, made in 1929 between the Dominion and the Provinces, it was provided inter alia in each agreement as follows:

> In order to secure to the Indians of the Province the continuance of the supply of game and fish for their support and subsistence, Canada agrees that the laws respecting game in force in the Province from time to time shall apply to the Indians within the boundaries thereof; provided, however, that the said Indians shall have the right, which the Province hereby assures to them, of hunting, trapping, and fishing game and fish for food at all seasons of the year on all unoccupied Crown lands and on any other lands to which the said Indians may have a right of access.

In addition to these privileges it has been the practice of the prairie Provinces to exempt Indians from payment of license fees for trapping.

BRITISH COLUMBIA

British Columbia is under the registered trap-line system whereby a trapper purchases the exclusive trapping rights in a defined area, usually a particular valley. These trap lines are granted for a period of 5 years with the privilege of renewal but subject to the compliance with regulations as to the holding of trapper's license, the regular and effective use of the line, and other conditions.

It has been the endeavor of the authorities to give preferential treatment to the Indians both as to choice of lines and reduced fees. In practice, however, the Indians have not always benefited to the extent intended, as the more aggressive and astute white competitors have found ways of securing trap lines that formerly comprised Indian hunting grounds. Steps are being taken, however, to remedy this condition by increased supervision.

There has been some difficulty, moreover, in the adaptation of the system of Indian conservation practice. For example, experienced Indian hunting families have been accustomed to have several

trap lines, of which only one is trapped during a particular season, or series of seasons, while the others are left undisturbed for future seasons in order that the fur may be replenished. This, in other words, is a rotation system which is an economic device similar in principle to rotation of crops.

As these questions become better understood it is expected that the system will work out to the mutual benefit of both Indians and whites, and that former causes of discord will be removed.

Indians in British Columbia also are granted certain special privileges in regard tothe taking of wildlife for food. The coastal Indians engage with success in commercial fishing but have no special privileges with regard thereto.

NORTHWEST TERRITORIES

In the Northwest Territories under Federal jurisdiction, comprising the Arctic Islands and that part of the mainland which lies west of Hudson's Bay and north of the sixtieth parallel, special hunting preserves for the exclusive use of Indians or Eskimos have been set aside as follows:

	Square miles
Arctic Islands Preserve	439,105
Yellowknife Preserve	70,000
Slave River Preserve	2,200
Peel River Preserve	3,300
Wood Buffalo Park	3,625

This plan has proven to be very satisfactory in the Northwest Territories both from the viewpoint of game conservation and as a protection for the natives.

It should be noted that Indian game preserves are not to be confused with Indian residential reserves. The former are tracts in which the Indians have special hunting privileges but no title to the land or resources, while the latter are the real property of the Indians. It may be mentioned that the Indian residential reserves, although numerous, are not large and are fairly well settled, so that in consequence the wildlife resources on them are very limited. Thus, although the Indians have exclusive hunting rights on their residential reserves the question is not important.

The reasons which have guided the trend of policy as outlined are epitomized in a resolution passed unanimously by the Interprovincial and Dominion Conference held in Ottawa in 1928, as follows:

Whereas it is recognized that most of the livelihood of the native Indians of Canada was obtained originally through some form of hunting, and that in unsettled districts in this country Indians are still largely dependent upon hunting, and especially upon hunting by means of traps, to provide them with the means of existence; and

Whereas the increasing white population of Canada and the increasing money value of fur is causing white trappers in many areas to invade more and more those trapping areas on which the Indians depend, so that results unsatisfactory to both whites and Indians are obtained, and extreme hardship for the Indians may in many cases be expected to result from continuance of this confused and unregulated competition; and

Whereas restriction of trapping rights in and to limited areas leads to increased interest in the conservation and maintenance of a supply of fur bearers on those areas: Therefore be it

Resolved, That this conference approves a policy of setting aside, as far as practicable, in unsettled regions, certain suitable and reasonable areas whereon Indians only may be allowed to trap.

In accordance with the spirit of this resolution, Canada is endeavoring to save what remains of the wildlife from exploitation by fur miners, and at the same time to assure to the Indians, under proper supervision, at least some happy hunting ground where they may pursue their ancient vocations unmolested.

Chairman SILCOX. May I, as chairman, express my appreciation to Mr. MacInnes and again to Mr. Marshall who have together given a contrasting solution to what has been a very difficult problem in the development in Canada and the United States of our relationship with the Indians.

With a historical background of the battle lines extending from the East to the West, and with a sympathetic understanding of what they had at stake, we can probably temper our judgment in regard to Geronimo, Powhatan, and Sitting Bull and various other Indians who have stood out in the development of our western country. It brings us to a much more sympathetic understanding of what problem there is involved in dealing with just this sector of game management.

We might go back and take a lesson out of the book of the Indian, in view of the fact that he had been cropping his game by the rotation system. It seems to me that the major problem we have is fighting our own predatory selves and setting up restrictions much more definite in character and more rigid enforcement on ourselves than on the Indians.

Just before introducing Mr. Wright, may I say that I ran across a Chinese legend last night which was written 450 years before Christ, in which this Chinese said:

> When you go into the woods be careful with your axe and when you sail into streams be careful that the meshes of your net are not too tight.

I thought it was rather apt—450 years before Christ a Chinaman was then thinking in terms of approaching nature at least without taking all it had to give and putting nothing back.

Mr. George M. Wright, of the National Park Service, will you present your paper now?

REMARKS OF MR. GEORGE M. WRIGHT

Mr. GEORGE M. WRIGHT. Mr. Chairman and guests of this conference, the North American Wildlife Conference spurred on by the unflagging energy of Jay Darling has painted the wildlife crisis in one and one-half days; brought lifelong foes together into a general federation of wildlife interests in one day; and now has us working frantically to complete the solution of the national wildlife restoration problem within our allotted day and one-half. All in all, I would say that there is no time for pleasantries and formalities.

I do, however, wish to express on behalf of Director Cammerer the gratitude of the National Park Service to the President for calling this conference and to all of you for meeting here this week in an honest effort to solve a national problem by national cooperation. It is the only way that it can be done.

The National Park Service is fully aware of the potentialities of the North American Wildlife Conference. The experience of the

National Park Service in wildlife conservation illustrates convincingly that the approach of this conference is the only one which holds out any hope for saving either the totality or any significant part of our wildlife heritage.

The national parks and monuments system is young, and the National Park Service, created in 1916, younger still; yet enough park history has been made to point a conservation warning only a little less dramatic than the Central Valley dust storms of the last few years. National parks are the only areas under Federal jurisdiction in which the beneficial protection of all forms of animal and plant life in their natural environment is mandatory. Though it could not be the case in the first years of little understanding of the national park idea and of still less funds for protection and administration, nevertheless it is the case that no public reservations give more care to wildlife than do the parks today. Poaching has been eliminated as a factor of consequence. Where the presence of visitors is inimical to wildlife interests, every reasonable human regulation is promulgated to obviate the damage. Wildlife technicians are employed to investigate wildlife problems in order that the scientific knowledge reposing in the Biological Survey and in various scientific institutions outside the Federal Government may be utilized and adapted to the specific requirements of parks wildlife. There is, too, a watchful public eye ever more penetrating, which demands that wilderness wildlife conditions be guarded as a sacred trust. Such watchfulness by the citizens of the Republic is the greatest safeguard of all.

These things are reported to you, not to brag of past accomplishments. That is something that it was agreed should be anathema to this conference. It is because it should be understood that in spite of such efforts, the wildlife of the national parks is doomed to ultimate destruction unless a national program for the restoration of wildlife environment and the regulation of wildlife utilization, becomes effective in the near future.

I do not need to dwell at length upon the reasons why no fence, either imaginary or real, can be erected on a park boundary, for everyone well knows that wildlife, which is perhaps the most sensitive of natural resources to civilization's influences, is oblivious to boundaries and fences and powerless to hide behind them. Overgrazing on headwaters above a part destroys the wildlife environments of the park canyons below. Thousands of Canada geese nest in Yellowstone but someone else must look after them in winter. The Roosevelt elk, finest of all the elk, cannot be saved in the Mount Olympus Monument if American elk are to be introduced on adjacent lands. Disease and pest contamination from domestic stock cannot be copied with on 600 square miles of a 10,000-square-mile mountain range. Even the home-loving trumpeter swans of Yellowstone must get out at times, and the sense of responsibility of the hunter for their care must be as great as that of the range force of Yellowstone Park if they are to be saved. Moreover, the park—large as it is—cannot provide adequate breeding range to perpetuate a safe remnant, and so more of the hereditary breeding range must be restored. The implications and complexities of these problems are endless. Until the furbearer's relations to the national economy

is understood and we restore the food and cover, lack of which is the real reason why some furbearers appear to lose their value and become known as predators, until then we will hear that parks are breeding dens from which hordes of predators emerge to ravage their enemies hundreds of miles distant.

Let me say to the other, "We will let you have your parks, your sanctuaries, and your refuges for sentimental enjoyment if you will just let us do as we please about the rest of the wildlife." Actually the shoe is on the other foot. Unless there can be a national program of wildlife restoration and conservation, then eventually the parks and sanctuaries will become drained of their wildlife and will become part of the growing biological desert of America.

Thus far I have dealt with the selfish side of the problem, speaking only of what the national program means to the national-parks system. There is another side to the relationship. What can the parks system contribute to the national program?

It was not by accident that the conference program gave first place to the possibilities of solving the wildlife-restoration problem by education. Appreciation is father to education. In the national parks, whose visitor list numbered 6,000,000 last year, there is the opportunity of all opportunities for combining with the inspirational drive to conservation appreciation some real teaching in the fundamental principles of wildlife restoration as worked out by this conference. The conference has made the National Park Service more than ever conscious of its responsibilities for wildlife, and I believe that I can promise you the result is sure to be seen in an increased attention to wildlife in the educational program of the Service.

The essence of this whole movement is the application to the land of scientifically founded wildlife management. We have said much about the restoration of environment because we know that the environment which existed when only the Indians were here was the most satisfactory for wildlife. The scientist is stopped, however, if he cannot find any places of original condition. In the terms of the profession, he needs his check plots. With untouched wildernesses at the vanishing point and ready to pass out entirely as soon as anybody wants them for commercial use, the national parks come more and more to be the best practical check plots available, and the ones most likely to be available the longest. As big laboratories, then, they protect something that we need if we are to know how to treat the rest of the land so as to restore natural habitats.

It has been reported by men working in the international wildlife protection field, that parks and similar reservations are the most practical devices yet found for the saving of the large game animals that are near to extinction or local extermination. Here, then, is another contribution. Moreover, where parks are successful in this, they become the sources for restocking. Elk, bison, and black bear are going to the Crow Agency in fulfilment of a restocking program which when completed will make the Crow Reservation a strong competitor of Yellowstone Park as a reservoir of the largest American mammals. If this is not wildlife restoration, then what is?

Finally I come to what to me seems to be the most important service the national parks system and should be made to render

in the national program. This is the perpetuation for all time of representative examples of the principal biotic associations of the whole country for the recreational and scientific inspiration of the people. When the parks system started this concept of the national parks idea did not exist. No wonder, for there was still too much of all kinds of virgin lands on hand for anyone to appreciate their value as such. So the people set aside Yellowstone, Yosemite, and so on, just to make sure that private interests would not lock up these natural wonders and keep them from the use of all the people.

Nor with the coming of Isle Royale, Death Valley, Great Smoky Mountains, and especially Big Bend and the Everglades, the national parks idea begins to take on a broader and a much more useful significance. The system when complete should include a large area of the prairie grasslands with its complement of bison and antelope, one of the best of the southern swamps, and so on.

Surely the national program for wildlife should include the reservation of such representative examples of the several types of wildlife wildernesses into which our ancestors struck their roots to create the United States of America. National parks and monuments are the only Federal device with which to accomplish this particular purpose, since all others are in some fashion dedicated to commercial purposes.

The administering agency is not the vital thing. It is upon the terms of the act or Executive order establishing the area which the people will have to depend to make sure they get what they want.

Though this is but a brief and partial exposition of a vital principle, it could just as well have been said in one sentence: The national parks system must depend upon a national program of wildlife restoration for its success, and the national parks and monuments can make some real contributions to the national program. [Applause.]

Chairman SILCOX. Although Mr. Wright stated that he was a little surprised at the way this group has assembled and stayed through these papers, I think that aside from some of the speeches at our major convention this has been an interesting afternoon. I think we are beginning to get in its setting the value of our national parks, not only from the standpoint of recreation, but the part they can play in preserving undisturbed biotic conditions and the fact that even with fairly large areas and places they have set aside, they are interdependent in a consideration of this wildlife problem as part of our national economy.

The next speaker is Mr. Ernest G. Holt, who represents the United States Soil Conservation Service. The Soil Conservation Service has been dramatized of late. Mr. Holt will tell us how that work fits into our whole program. [Applause.]

REMARKS OF MR. ERNEST G. HOLT

Mr. ERNEST G. HOLT. Mr. Chairman, Ladies, and Gentlemen: In presenting the part the Soil Conservation Service may play in the restoration of the wildlife resources of the United States, I am moved to borrow as my text the caption of our exhibit at the Mayflower Hotel: "Soil Conservation Means Wildlife Conservation."

So intimately are these concepts connected that the phrase might well serve as a slogan for the wildlife activities of the Service, although a negative statement of the principle would more precisely express its truth. For there can be no real wildlife conservation in the absence of soil conservation. This is basic, fundamental, yet it is a fact that only now is being fully realized by wildlife conservationists.

Soil is the foundation on which rests not only our agricultural prosperity, our national existence, our own very lives, but as well the lives of all other organisms. Yet dependent as all living things are upon the soil, their welfare is conditioned upon soil in its proper place and in proper proportions. If soil is a giver of life, it is also a destroyer of life. Shifting sands and silt-charged streams are largely biotic deserts.

In the normal operation of geologic processes soil movements have been gradual, and have not in themselves adversely affected the flora and fauna. However, the rise of man to the state that we are pleased to call "civilization" has changed all that.

The first white arrivals upon American shores were unanimous in extolling the Redskins' country as a land of plenty. Coming from an older, civilized land, they were astounded to find that nature could be so bountiful. Even the Pilgrim in bleak New England went to the woods for his thanksgiving turkey—and got it.

But this happy state was not to endure. To our forefathers, just as she is to us today, Nature was an enemy to be subjugated, not a friend with whom to live as good neighbors. And their campaign against the Good Mother went much as a military venture in East Africa is going now. The invaders were repulsed here and there, but in the end the cause of "civilization," backed by modern weapons, was bound to prevail. Fire, presettlement America had known of old, but the ax and the plow—these were new and invincible. So the forests were cut down and the land was plowed up.

And then came erosion.

The more land cleared, the more erosion there was. The more land sapped of its fertility by erosion, the greater the acreage needed for crop production, and the more land it was necessary to clear. So began a vicious circle. And we are still running around in it. What our ancestors started, we seem determined to finish. And finish it we will, unless there is a complete about-face in public attitude toward our most vital natural resource. Remember, there are now 127,000,000 of us instead of just a few thousands alleged to have come over in the *Mayflower*.

When that good ship put into port all the land in cultivation in what is now the United States would hardly have made a parcel larger than a southern California ranch. Last year, the farm land of the country was inventoried at better than a billion acres.

It is well known that the opening of the country to agriculture, though fatal to the larger species, actually increased certain other types of wildlife, so-called farm game, for example. But this increase stopped at a certain point. With the progressive intensification of agriculture there has been a parallel decline in farm game in spite of more and more restrictions on hunting.

Another important item in this inventory of the status quo is the fact that about 75 percent of our agricultural land has some degree

of slope. The result is that 100,000,000 acres of good farm land have been essentially destroyed by erosion for further crop use; another 100,000,000 acres have been severally impoverished by the loss of much of their productive top soil; and on yet a third 100,000,000 acres erosion is getting actively under way. The destruction wrought by this insidious scourge is continuing at the rate of approximately 250,000 acres a year.

If you are inclined to assume that these ruined acres revert to wildlife territories, ask any ecologist whether good food and cover plants thrive on raw clay subsoil.

We have been barking up the wrong stump with respect to the diminution of farm wildlife. We have passed the buck to this and that, while the real factor in the disappearance of our farm game is our own zeal for complete subjugation of the land, the reckless abandon with which we have ripped off its protective covering of vegetation as we would strip the hide from a rabbit.

If it is true that soil and wildlife go downhill together, it is obvious that they must be brought back the same way. That is the cardinal principle underlying the wildlife program of the Soil Conservation Service. Wildlife conservation cannot be considered apart from soil conservation; one must be integral with the other. Were this not true we would have no wildlife functions to perform, for our raison d'etre is the conservation of soil.

Broadly stated, the objectives of the Service are: To propagate the use of soil-conservation practices in agriculture through the medium of demonstration; to effect at the same time a maximum control of erosion on as large an area of agricultural land as possible; and to ascertain the fundamental scientific facts essential to the development and improvement of soil-conservation methods and techniques.

It is patent that every manipulation of the soil directly affects the creatures dependent upon the soil. It is equally clear that the operations of the Soil Conservation Service, extending as they now do into every corner of the country and involving millions of acres of land, have an extremely high potential as far as wildlife is concerned. The proper direction of that potential is the function of the Service's newly created Section of Wildlife Management.

The aims of the section are to attain and maintain on the lands of cooperating farmers, wildlife populations as biologically sound as possible under the limitations imposed by primary land use. Admittedly this implies a compromise, but so does the whole soil conservation program.

If nature employs vegetation to make the soil stay put, then so must we, but we cannot return to the whole country its pristine covering of leaf and blade. The Nation has its very roots in agriculture, and if the Nation is to persist we must continue to farm. But if we would continue to farm we must keep our soil. A compromise, then, is the only way out of the dilemma.

The Service holds that protection and production are not necessarily incompatible, and seeks means to render the compromises as easy on the farmer as possible. Its program is essentially one of better land use. Its aim is to rededicate each acre to the purposes for which it is best adapted and to obtain adequate protection for all valuable land needing protection.

The program is carried out through demonstration projects. These usually embrace an entire drainage basin, though the work areas of the 450 C. C. C. camps under the direction of the Service are not always so selected. Most operations are on private farms, under the terms of a cooperative agreement whereby the farmer pledges himself to carry out for a period of 5 years the plans devised by the Service for his particular farm. The formulation of these plans is the function of the project technical staff, which studies on the ground the individual problems presented by each cooperating farm and endeavors to so revise the farm lay-out and readjust farm procedure as to insure the highest possible degree of rainfall absorption, erosion protection, and reduction of flood hazard and silting, while permitting profitable operation of the farm.

The methods employed run the gamut of agronomy, biology, engineering, forestry, and soil science, but the basic idea underlying all is the maximum possible restoration of vegetable cover.

The wildlife specialist could not ask a better opportunity for the application of his science. Naturally, our first efforts are directed toward rebuilding the habitats vital to the existence of the creatures of the wild, toward the restoration of food and cover plants in proper relation, and with adequate interspersion. With revegetation the keynote of the soil-conservation program, wildlife management in the Service largely resolves itself into proper coordination of erosion-control operations so as to obtain the desired environmental controls. To accomplish this coordination the biologist helps draw up the farm plans.

To him the repair of wounds caused by the ravages of erosion offers a chance to recreate the conditions of wildlife existence. He envisages every odd corner as a haven, every gully as a refuge, for by selecting with a view to wildlife welfare the plant species used for soil stabilization he is able to translate his vision into fact.

But the wildlife manager does not stop there. In reorganizing the farm lay-out, many spots which cannot be profitably used for crop production are dedicated to wildlife uses. Arrangements may be made for strips of grass to be left along the fences for nesting cover. Through the forester, the necessary variety is obtained in woodlot plantings to provide a permanent food supply for woodland animals, and timber stand improvement crews are taught to leave a few so-called "weed" trees, hollow trees, and so on.

Now, you will have noted that we have no control over either the soils we seek to conserve or the wildlife we would restore save that given us by our 5-year agreement with the farmer. You may well ask, therefore, what all this work will profit after the expiration of the agreement.

So far as the control of erosion goes, we are confident that our demonstration will be so convincing that the farmer will not care to return to his old practices. The wildlife work is a different matter. Whether that will be continued after the Service passes out of the picture depends largely upon the sportsmen. Although we are working for all wildlife, the degree and character of sportsmen—appreciation of the game crop developed through this program will largely determine the farmer's attitude toward it. Our woody plantings will remain, of course, but these are by no means all there is to successful

management, and the other techniques require care and labor and much of what to a farmer is just plain bother. Moreover, many of our cooperators have hesitated to take part in the wildlife program because they were actually afraid of the consequences of having game on their farms.

We yell about the disappearance of game, yet do nothing that would induce the farmer to prevent it. Despite all the laws on the books the farmer still holds the fate of farm wildlife in the hollow of his hand, and we are not going to get anywhere with a long-range program for restoration of farm game until farm game is put on the same basis as any other crop. The crop must be managed for sustained yield, and it must be productive of adequate return to the farmer for his investment of land and labor. The form of that return may be relatively unimportant; its adequacy is vital.

Our Service can show the farmer how to develop the crop, but whether he continues to produce it depends upon the public. The advice and help of State officials and agricultural colleges is specifically sought in working out our general program; and, of course, we lean heavily on our colleagues of the Biological Survey for technical wildlife information. But all any official agency can do is point the way.

There are now cooperating with us more than 13,000 farmers who control nearly 2,000,000 acres of land. That's a lot of land, and we take great pride in what we are doing with it, but the area in this country being attacked by erosion totals nearly half a billion acres.

If the salvation of our wildlife is a job too big for any one agency, how patent it is that the salvation of our soil, on which all life depends, is a task that demands the concerted and determined action of the whole nation. [Applause.]

Chairman SILCOX. We want to express our appreciation to Mr. Holt for adding to the whole integrated picture another sector, and it is a very large one at that, involving, as Mr. Holt emphasized, some half a billion acres.

Those of us who have traveled around the United States have seen certain things that have been happening. I am reminded of a quotation that when De Soto came up to a certain part of the Mississippi Valley area he stated that if they put a plow into that soil it would wash to the sea. De Soto's prediction has been somewhat fulfilled, in that many of the stream beds in the very region about which he made that remark now are filled with 6 and 8 feet of sand, and the alluvial bottoms which the agricultural civilization existed upon have been almost wiped out, so that not only the foundations for wildlife but for human life have been eliminated.

In this general presentation this afternoon we are gradually fitting the whole picture of conservation of which wildlife is so vital a part, and forming the basis upon which we have to approach it as a part of our national economy.

We have another sector of that picture which will be presented to you by Lt. Col. William H. Hobson, of Fort Snelling, Minn. We have a large number of military reservations in the United States, and Lieutenant Colonel Hobson will tell you what we have done on these reservations as another part of this general picture.

Address of Lt. Col. William H. Hobson

Lt. Col. William H. Hobson. Mr. Chairman, ladies, and gentlemen, a speak to you primarily as one of the rank and file of Army sportsmen-conservationists. Like my distinguished comrade in arms from Canada, who entertained us so delightfully at the banquet the other night, I assure you—and General MacBrien, too, if he is present—that Americans also look with suspicion upon one of their military men who claims any public-speaking prowess. But you will observe presently that you need have no suspicion of me on that account.

Before proceeding further with my main subject, Game Management on Army Reservations, I wish to read to you from a short letter:

War Department,
Office of the Chief of Staff,
Washington, February 5, 1936.

Dear Colonel Hobson: The War Department is pleased to have you represent it at the North American Wildlife Conference which is now in session in Washington pursuant to a call by the President of the United States. Please extend to the delegates the greetings of the War Department, and also assure them of its desire to avail itself of every opportunity, whenever practicable, to use its facilities, both alone and in cooperation with other agencies—Federal, State, and private—to the end that an effective program may be worked out for the restoration and conservation of such a valuable national resource as American wildlife.

Very sincerely,

Geo. S. Simonds,
Major General,
Deputy Chief of Staff.

Thus you see, the Army—your Army—following the example of its Commander in Chief, President Roosevelt, who performs a great public service by calling this conference, naturally expects to play its rightful part in the present-day battle to salvage vanishing wildlife.

Perhaps I can best use the brief time alloted me by explaining the soldier's viewpoint on this timely national problem, by picturing the facilities or means at his disposal, and by giving a few of the many illustrations of how the Army is approaching a solution of the wildlife problem in a routine way on its posts and military reservations, both alone and in cooperation with other agencies—Federal, State, and private.

The grateful American soldier of today welcomes the opportunity to restore to wildlife, in some small measure at least, a part of what his predecessors in uniform have taken in the name of necessity and sport.

Unity of command, coordinated action, cooperation—those are some of the terms of the soldier's parlance that I, as one of them, am glad to note, have been adopted at this conference, and will be applied in the future wildlife movement.

Now, what can the Army actually do for wildlife restoration and conservation?

The best way to answer that question is to ask you to bear in mind these facts:

The Regular Army today has an authorized strength of 165,000 officers and men; scattered over the United States alone there are

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Fire lookout observatory on Striped Peak, Coeur d'Alene National Forest, Idaho. Living quarters for the observer are beneath the glassed-in "crow's-nest." Detecting fires at the start may save much wildlife. (Forest Service photo.)

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A thrifty stand of Engelmann spruce in the Boise National Forest, Idaho. Wildlife is confined to the "edges" of such dense growths. (Forest Service photo.)

some 375 separate War Department real-estate holdings, posts, and reservations, (active and otherwise), extending in acreage from very small ones like 12-acre Bedloe Island, on which rests the Statue of Liberty in New York Harbor, to large ones like Forts Bragg, N. C., and Benning, Ga., of 100,000 or more acres each. In all the War Department has jurisdiction over approximately a million and a half acres in the Continental United States. Besides, remember that the War Department now has administrative control over about a half million young men of the Civilian Conservation Corps in about 2,400 camps. On some 26 of the 181 wildlife refuges, under the control of the Bureau of Biological Survey, you will find C. C. C. companies working upon conservation projects.

You will be pleased to learn that United States Corps of Engineers is now following a policy of cooperation, to the best of their ability, with other agencies interested in the preservation of wildlife. The Army engineers call on the other Federal agencies for assistance in the preparation of their (the engineers) plans for rivers and harbors and flood control works, on which they expended the last fiscal year about $200,000,000. They do this to provide maximum protection for wildlife or to minimize any destructive effects. Examples of this are, for instance, with the Department of Agriculture in the Upper Mississippi Canalization Project and with the Bureau of Fisheries in the design of Bonneville Dam to provide adequate fishways for the salmon run on the Columbia River.

But the greatest facility, ladies and gentlemen, that the Army has for aiding the wildlife movement, I believe, is its attitude toward the problem—an attitude of patriotic willingness and ability to work and fight to help save such tremendously priceless national resource. Certainly, at last, the thinking American people are beginning to realize—we hope not too late—that their previous attitude of complacency and indifference will not bring back our game and fish, something of enormous economic and esthetic value.

Now, let us examine now for a moment how the Army is attempting to solve the wildlife problem on its reservations. If you should visit many of our large reservations today you would find a system of game management (a new term) in vogue which is producing most encouraging results. Perhaps you would carry away with you some idea that could be used to great advantage in your conservation experiments in civil communities, even though we all realize how very dissimilar in many respects conditions are on a military reservation from those of a civilian community of an equal area.

I wish that I had the time to read to you a most enthusiastic report I recently received from Col. J. P. Barney, United States Army, until recently the commander of the C. C. C. reconditioning camp and part of the time commanding at Fort Knox, Ky., where he served during the past 3 years. He described how, when he assumed command of that 30,000-acre reservation near Louisville, it was an almost gameless public shooting ground, overrun with all kinds of predatory vermin. Colonel Barney, like me, please remember, claims to be nothing more than a soldier-sportsman who would like to be instrumental in passing some game and fish on to future generations. Without expending any Federal money whatsoever

for materials, but using good old common sense and lots of energy and C. C. C. enrollees, he started in with a game management program which embraced the known essentials; restrictive hunting regulations; vermin control; establishment of certain restricted areas as sanctuaries; planting of needed foods for upland game around their coverts and also for wildfowl in ponds and artificial lakes; restocking the shot-out areas with quail, pheasants, guinea fowl, wild turkey, English roe deer— all of which, using Colonel Barney's expression, "have thrived marvelously."

Colonel Barney's only fund for all of this progrem was that derived from a small annual hunting and fishing license of $1.25 a year, charged the hunter personnel stationed on the reservation. The State of Kentucky and the Kentucky Pointer and Setter Club cooperated with him by contributing some quail for restocking, and Mr. Darling of the Biological Survey sent a member of his field staff to the Fort Knox to advise regarding the planting in the ponds and swamps various varieties of duck and fish foods. Colonel Barney, it seems to me, expressed the typical philosophy of the sportsman-conservationist in the last paragraph of his report when he said:

> I hope very much that in 2 or 3 years the Fort Knox Reservation will be a source of real enjoyment for the sportsman personnel stationed here.

Here, ladies and gentlemen, is an example of what energy, common sense, hard work, and cooperation among the conservationist of a community can accomplish in game restoration, even if the operation is on a financial shoestring.

A similar report from Fort Sill, Okla., a reservation of some 50,000 acres, shows splendid progress along conservation lines. Capt. Clarence P. Townsley, Field Artillery, who heads the game warden's department at Fort Sill, modestly gives credit for the modern Fort Sill system of game management to Capt. J. D. Balmer, Field Artillery, who, in 1927, laid the foundation for the efficient organization, consisting of the warden himself and 29 assistants.

Right here, while speaking of Fort Sill's system, I would like to insert a few remarks to give credit where I think credit is due. My study of the history of the Army's efforts along conservation lines reveals these facts: Back in 1926 Capt. R. F. Riggs, of East Alton, Ill., suggested to Mr. Nash Buckingham, another well-known conservationist, that it would be an excellent idea if the United States Army could be interested in game propagation and management on Army posts and reservations. Captain Riggs, upon investigation, learned that a friend of his, now Col. Robert H. Lewis, Field Artillery, who was then on duty at Fort Sill, was already engaged in such work. Captain Riggs and Mr. Buckingham then visited Washington and called on the then Deputy Chief of Staff, Maj. Gen. George Van Horn Moseley, who is now commanding the Fourth Corps Area with headquarters at Atlanta, Ga. General Moseley showed great interest in the suggested plan of these two practical civilian pioneer conservationists and assured them of the active cooperation of the War Department.

Later Mr. Buckingham interested the National Committee on Wildlife Legislation in the plan, and again the Army renewed an interest which has grown apace. Moreover, Mr. Buckingham and

Mr. Henry P. Davis later pioneered game restoration through their contacts with Army officials at Fort Knox, Ky. This bit of history I mention here to reveal the cooperative attitude of the Army with civilian conservationists by carrying its share of the burden that rests heavily upon all of our shoulders. As a representative of the Army, I salute those civilian pioneers who, years ago, offered their cooperation to the Army.

General Manus McCloskey, an old West Point instructor of mine, now commanding Fort Bragg, a reservation of about 122,000 acres, apparently is as great a conservation enthusiast as he is a military leader. He paints a glowing picture of the wonderful game resources of his reservation, all of this accomplished during the last decade. Reading from the 1935 edition of "Army Posts and Towns", a book which gives a description of the various posts of the Army, one reads under the heading "Sports Facilities at Fort Bragg":

> Hunting: The reservation itself is a hunter's paradise; the range has been systematically stocked. Deer, fox, rabbits, squirrels, wild turkey, quail, pheasants, wild hog, duck, and snipe are found in abundance. Several of the prewar farm houses have been converted into hunting lodges.
>
> Fishing: The lakes on the reservation have been stocked with bass, pike and perch. * * *

So much for Fort Bragg.

I don't have to read from a book or a report to tell you a bit more in detail about the equally abundant wildlife resources and the game management system of another reservation, Fort Benning, Ga., for I was stationed there year before last. Fort Benning, like Fort Bragg, is a post-war reservation of almost 100,000 acres. It is located about 8 miles southeast of Columbus on the east (Georgia) bank of the Chattahoochee River which forms the boundary between Alabama and Georgia. The infantry school is located at Benning. To maintain adequate hunting and fishing facilities for a garrison of 10,000 people has naturally required an efficient game management system.

I'll briefly mention some of the outstanding characteristics of the Benning system which, as it now exists, is the evolutionary consequence of some 10 years of conservation progress.

My friend, Col. O. W. Griswold, president of the Fish and Game Commission, in a letter to me under date of January 13, 1936, accompanied by his annual reports for the past 2 years, writes in part:

> The Fish and Game Commission at Benning is a growing concern. Hardly any decision with reference to fish and game matters is ever made by post headquarters before referring the matter to me as president. In that respect we have the entire cooperation and backing of the commandant, General Estes, which really makes our commission an active affair * * *.

Here, fellow conservationists, is an example of good results attained for wildlife primarily through efficient leadership and organization. To facilitate the work of the commission a number of subcommittees function under the control of the President: namely, an executive subcommittee, the fish subcommittee, the game-birds subcommittee, and the game-animals subcommittee. All of the officers doing this splendid committee work are busy men, like most of us are, yet they find time during recreation hours to do their bit for wildlife.

The program upon which the commission is now working for the year 1935–36 embraces:

(*a*) The construction of at least two new ponds for fish and the stocking of them.

(*b*) Formulation of a program of proper closing, rotation, and restocking of all the ponds and lakes.

(*c*) Continuation and enlargement of its present program to provide specifically for:

(1) Controlled burning of grass and underbrush.

(2) Planting of peas in the spring.

(3) Planting of winter wheat in the fall.

(4) Experimentation with waterfowl food.

(5) Experimentation with vegetation for fish food.

(6) Experimentation in trapping, redistribution, and transferring of quail and wild turkey.

(7) Experimentation as to local propagation of quail and turkey.

(*d*) Maintenance of contact with and study of the best civilian practices pertaining to game and fish propagation and conservation with a view to adopting those applying to the reservation, so far as the conditions and local facilities permit.

(*e*) Stabilization of an adequate workable program which will act more or less automatically from year to year, thus insuring a continuous policy over a long period of time.

(*f*) The bringing about of a better general conception to the command as a whole as to the necessity for conservation and propagation of game and fish, to the end that this phase of outdoor recreation will always be available on the reservation.

(*g*) Furtherance of a more adequate check-up on hunters and fishermen.

Ladies and gentlemen, there is another program that is producing wonderful results on an Army reservation at an annual expenditure of less than $300, raised from hunting-license fees. A similar program, I believe, could be made to function in any civil community, if public opinion in that community demanded it. Make true sportsmen of your hunters and fishermen, I maintain, and your game and fish will soon be looked upon as a priceless crop, which, if properly cultivated from year to year, will bear a harvest in the form of ample surplus game and fish for the sportsmen of future generations.

Protection in the form of restrictive game regulations, alone, will not produce game, yet it is largely responsible for the bountiful wildlife resources on many of the military reservations. Invariably, I think, you will find their bag limits and open seasons well within those legally permitted in the local communities. And, with equal opportunity to all personnel—officers and enlisted men—to hunt and fish, there is, in the main, a very high standard of scrupulous compliance with the game laws, a thing which we would all appreciate seeing emulated in every community in the United States.

Effective enforcement, in a large measure, has been accomplished through a provision of the Benning game regulations, which reads:

> Requests for hunting permits by enlisted men must be endorsed by their regimental or separate unit commanders, with a statement that the soldier can be depended upon to handle firearms afield without injury to himself or others and that he can be relied upon to comply with the spirit and letter of hunting regulations.

Twenty-seven carefully selected sportsmen game wardens who freely volunteer their services are ever vigilant to see that the regulations are complied with. What good, I ask you, is any law without a police force? How long could the Army maintain discipline without military laws, regulations, and enforcement?

In addition to the larger reservations there are the many small posts where conservation-minded commanding officers maintain sanctuaries for the over 600 species of winged migrants that go north and south with the seasons. For example, at my present station, Fort Snelling, Minn., a post of about 2,200 acres, I frequently see from the window of my study a dozen ring-necked pheasants, part of a pheasant population of some 2,000 birds, feeding at a cleared spot in my back garden, one of many on the reservation, where the Boy Scouts and members of the post conservation detail, several days of the week, scatter grain donated by the Minnesota Conservation Department. With the thermometer for days varying from 0 to 38 below, the birds, without artificial feeding, would suffer severely. Over the bluffs beyond my garden, a few hundred yards away, every morning I hear a hundred or more mallards quacking around the open water where a spring boils out into a slough flowing into the frozen-over Minnesota River. These ducks are fed daily and, despite the severe cold, never leave their year-around nesting and feeding sanctuary, maintained under the proud surveillance of the post commander, Brig. Gen. David L. Stone.

Here in the Tidal Basin, within gunshot range of Washington's Monument, I used to watch, during my long service here, with the greatest interest ducks of many species feeding on the grain planted there by the local park officials during the hunting season and later during the period of the migration north in spring.

One of my sentimental memories of Fort Benning is that of watching from my bedroom window a mother wild turkey which used to lead warily her flock out of the woods at dawn into the flower garden in rear of my quarters and feed on the grain that we kept there for her.

Anyone familiar with the habits of wildlife—birds and animals—knows how readily they respond to protection. There is no doubt in my mind but that an adequate supply of wildlife can be restored to American covorts, if the American people will make up their minds to pay the price of restoration. It isn't entirely a matter of money, game laws, closed seasons, and so forth. Give me the spirit of true sportsmanship in a community and I'll show you a community abundant in wildlife, if the habitat is suitable.

The Army is proud of its ambitious program in the new wildlife movement, and I hope that you now better realize what a great big conservation wallop it packs and the extent of its active efforts along scientific game-management lines, both on its own responsibility and in cooperation with all the many other agencies to help restore an adequate supply of wildlife for future generations in our great country.

In conclusion, I wish to state that I believe—thank God—that the wildlife restoration and conservation movement is now progressing encouragingly, but to win back permanently to outdoor America an adequate supply of all species of wildlife, Miss Conservation must

keep her foot on the present throttle of enthusiasm for her cause while the going is good. If she indifferently lets the motor idle, she'll eventually, perhaps within the experience of our lives, surely see many of her species gradually disappear over the horizon of extinction, as have some of us here observed the passing of the passenger pigeon, the heath hen, and others.

So far, my friends, you may have interpreted my remarks as those of an Army man trying to pass out propaganda on what the Army has done to preserve wildlife and the great American out of doors; but, finally, I'd like to address you simply as what I really prefer to be regarded, a plain old former west Tennessee sportsman, who doesn't resent being called a sentimentalist.

My friends, we who love wildlife are here in a huddle to put over a muchly needed touchdown for American game and fish; and God willing, to reach that goal we've got to accomplish at least these things, as I see it:

We delegates to this, another, conference will certainly leave here, inspired as never before, to fight a winning battle for wildlife; we've got to "saw wood", we've got to support actively and loyally the existing agencies and the new civilian federation, born during this conference—an organization which will effectively coordinate our many divergent petty differences regarding the solution of the problem in general, so that the voices of the millions of true conservationists—sportsmen and sentimentalists—will be heard and heeded by the powers that be—Federal, State, and private.

In the course of human events, outstanding in the history of American conservation, there have transpired at this great North American Wildlife Conference, I believe, things that are a source of deep, human satisfaction to all of us who are here today. The momentous steps taken at this conference, in my humble opinion, have been taken in the right direction. The public conscience has been aroused over the problem of preserving our natural resources as never before. All of the conservation organizations may now look to centralized directorship. As a soldier, again I salute the men responsible for conceiving the plan out of which the new federation was born.

Finally, may I add, "by uniting we stand, by dividing we fall." So spoke the patriot John Dickinson 168 years ago, when a young America perceived its liberty about to vanish. If divided we fall, there surely will eventually pass into ignominious extinction another very precious American heritage—our great out of doors and the wild creatures that are now valiantly struggling there for existence.

But, I demand of you and of myself, why should we fall? We should not, I maintain, and, God helping us, if all the self-styled friends of wildlife will loyally support the existing and the new conservation machinery and fight together, victory will be ours and also wildlife's. [Applause.]

Chairman SILCOX. We are indebted to Lieutenant Colonel Hobson for opening up to this audience some of the work that has been done by the Army in this whole field of conservation. It covers, as Colonel Hobson told you, the work on rivers and harbors, the work on the military reservations, and we have admitted one more sector to this general picture.

We have with us Mr. J. A. Rodd, of the Federal Department of Fisheries, and of the Biological Board of Canada, who will talk to us about the Canadian program.

Address of Hon. J. A. Rodd, of the Department of Fisheries of Canada

Mr. J. A. Rodd (Ottawa, Canada). Mr. Chairman, ladies, and gentlemen, it is my privilege as a preface to my remarks to convey to this conference greetings from the Federal Department of Fisheries and from the Biological Board of Canada, as well as their very best wishes for every success in your deliberations. I would also extend my personal congratulations on the progress that the conference has made during the past few days in the interests of wildlife and on the further progress that is assured.

The Department of Fisheries and the Biological Board of Canada, which is the Federal fisheries research board, hold a position, in regard to fisheries problems in Canada, similar in many respects to the position held by the Bureau of Fisheries in regard to fisheries problems in this country, with this difference, that some of your problems are more acute than ours are at the moment because of your larger population and greater industrial developement.

As it was recognized that closer coordination of the activities of the various agencies which are concerned with game fish or fresh-water fish culture could only be mutually beneficial a national fresh-water fish cultural policy, which I shall endeavor to outline to you, was adopted on the third of last month.

Adoption of a national fresh-water fish-cultural policy and the initiation of definite action to give the policy effect were the most significant steps of the last 12 months in Canada as regards the conservation and development of our game fish resources. The policy was adopted at a national conference held in Ottawa last month and at the present time the personnel is being chosen for a national committee which, among other related duties, will promote the coordination and development of fresh-water fish-cultural technique and fresh-water research, and advise such other action in respect to the science and technology of fish culture as may be found advisable.

Going back to the American Game Conference of 1935, I may recall that in the closing paragraph of a paper which I presented at that time it was pointed out that while Canadian game fish development based on biological and statistical facts was really only in its initial stages "our game fish policy implies an orderly program for the investigation, management, and development of our game fish resources, keeping in view current needs and provision for the future."

It was in pursuance of the program for orderly development that our recent national conference on fresh-water fish culture was held. The conference, which convened at Ottawa on January 3 of this year, was representative of all Canadian interests concerned with the development of our game fish resources. Included among the interests so represented were the Federal Department of Fisheries, whose minister opened the conference and was present

throughout the sessions; the Biological Board of Canada, which is the Federal fisheries research board; the National Research Council; the branch of the Interior Department administering our national parks; the Canadian Travel Bureau, operated by the Dominion Government; the several Provincial governments; the Canadian National Railways, and the Canadian Pacific Railway. By means of papers and discussions the conference sought to obtain a comprehensive view of the problems of fresh-water fish culture as they exist in the respective Provinces, and through the interchange of information to reach a sound conclusion as to how further necessary research may be carried on most efficiently.

After a full presentation of the problems and status of research in the various parts of the Dominion had been made, consideration was given to a proposal for a fresh-water fish-cultural policy which, while nationally comprehensive, would not diminish the responsibilities or infringe the rights of any organization coming within the limits of its scope. Out of the consideration of this proposal came the adoption of a resolution that a national committee be set up, consisting of one representative to be named by each of the following bodies: The Dominion Department of Fisheries, the Biological Board, the National Research Council, the National Parks Branch of the Department of the Interior, the Canadian Travel Bureau, the several Provincial governments, the Canadian Pacific Railway, and the Canadian National Railways. Selection of their committee members is now being made by the respective orginizations, at the request of the Federal Minister of Fisheries.

Under the conference resolution, this liaison committee will be known as the National Committee on Fish Culture and its duties shall be—

(*a*) To act as a clearing house for information and suggestions regarding every branch of fish culture; (*b*) to promote the coordination and development of research and fish-cultural technique, to consider what researches should be undertaken and to recommend accordingly; (*c*) to advise such other action in respect to the science and technologly of fish culture as may be deemed advisable.

The committee will operate with a joint secretariat consisting of one representative from the Biological Board and one from the National Research Council, and pursuant to a clause in the conference resolution it may appoint a small working executive. The responsibility of calling meetings of the National Committee will rest with the chairman of the Biological Board and the president of the National Research Council. No permanent chairman of the committee will be appointed but at each meeting a presiding officer will be chosen from the members present.

So far as the freshwater fish cultural policy is concerned, its main features may be summarized as follows:

1. A Canadian fresh-water fish cultural policy national in its scope and its application.

2. The defining of the spheres of activity of each organization or agency which is in a position to cooperate in fresh-water fish culture throughout Canada.

3. The outlining of broad objectives for future fish cultural administration and development.

4. The setting up of research objectives.

5. A definition of the essentials of a pollution policy in regard to fresh-water fish culture.

It envisages the definition of the spheres of activity of each agency in a position to cooperate in Canadian fresh-water fish culture, the delineation of broad objectives for future fish cultural administration and development, the esablishment of research objectives, and a definition of the essentials of a pollution-control policy.

Under such a national policy, the several interested agencies would regard the development of the fresh-water resources as a factor in national wealth and not as a matter of simply provincial or local concern. The fisheries would be viewed as annual crops to be cultivated and reaped as such in somewhat the same way as land crops are developed to give the greatest return to the largest number for a reasonably justifiable outlay.

Under a national policy of this nature the efforts of the various agencies would be coordinated and consideration given to the following matters:

The recognition of the principle of prior right for the fisheries in all reclamation, drainage, irrigation, flood control, water storage and water-power projects, and in the development of natural resources.

Management of public fishing waters.

Educational campaigns regarding conservation.

Private fish farm propagation for commercial purposes and the development of privately controlled fishing areas.

River, stream, and lake surveys and improvements.

Soil erosion and reforestation.

Research on maximum productivity of lakes and streams.

Statistical surveys of abundance, including creel census.

Improvement in fish cultural methods, including transportation.

Proper stocking policies and standards.

Sources of egg supply for fish cultural purposes. Nonindigenous species and local strains of fish.

Nutrition.

Nurseries and refuges.

Natural history studies.

Competitor and enemy fish.

Parasites and diseases.

Pollution.

A pollution policy should recognize the fisheries values in water resources, as well as public health and industrial and municipal values; and that it should provide for the securing of proper information with reference to the effects of pollution on the fisheries as well as upon public health, and so forth, as a basis for control action. This would necessitate thorough study by qualified investigators and a recognition by all interests that such study is of equal importance with investigations from other standpoints. [Applause.]

Chairman SILCOX. We, of course, have been most happy to have our representatives from our sister nations to the north and south through this entire conference and to have the interchange of ideas and of scientific information and the helpful contributions in the form of papers in generous response to the invitation extended to them. We want to express our special appreciation.

We have with us Señor Juan Zinser, who has appeared on our program as the delegate from Mexico, and we are to hear from him. [Applause.]

Address of Señor Juan Zinser, of Mexico

Señor Juan Zinser. Mr. Chairman, ladies, and gentlemen, I am going to give you some points about the program of the Mexican Government in the conservation of wildlife.

In general, I am in a position to affirm that the purposes of the Mexican Government as pertains to hunting are as follows:

The Department of Forestry, Game, and Fish shall avoid in the future the drying of ponds and water holes that may serve as a refuge to migratory birds as well as the places used by animals as drinking places.

The creation of national parks shall be continued. At the present time there exist such parks in the Desierto de los Leones, El Chico, the Popocatepetl, the Ixtaccihuatl, and in the Nevado of Toluca. In these parks it is forbidden to hunt.

Game preserves will be established in various sections of the country, among which shall be that in the district of Altar, destined specially for the preservation of sheep, antelope, and deer. Another will be created in the Sierra of Chihuahua, and others will be created in other sections of the Republic.

The greater portion of the preserves will be established in zones of a limited extent so as to avoid the excess of rebreeding, and these animals will be distributed in the adjoining regions so as to be used by the hunters of the neighboring places.

Zones of refuge shall be established for migratory birds in diverse places of the Republic, especially in the north, in the central portions, and along the coasts. Prohibitions will be established in accordance with scientific criteria.

Now I am going to announce to you that the treaty between the United States of America and Mexico has been signed provisionally this afternoon. [Applause.] This treaty will be signed this evening at 6 o'clock, Mexican time, definite. [Applause.]

It will limit the exportation of game mammals and their by-products. Permission shall be granted by the Forestry Department for game trophies which may have been secured by nonresident hunters duly authorized by the authorities.

It will freely permit the commercial exportation of skins of animals harmful to agriculture, and predatory animals.

Plagues and diseases which affect directly game and its prophylaxis will be studied.

There shall be avoided the dumping of oils, factory refuse, and other products of industry harmful to game, in general, whether in rivers, lakes, or other places visited by wild animals.

Finally, all legal dispositions which science may dictate will be enacted in accordance with good judgment and the necessities that may appear. [Applause.]

Chairman Silcox. Thank you very much, Señor Zinser. I am sure that it is a very important announcement and one that we are all glad to hear.

I want to make this announcement—that the Forest Service has set up within itself a section on wildlife to make sure that they can be adequately represented in the management of the now approximately 180,000,000 acres of land under the jurisdiction of the Forest Service. [Applause.]

I hope as this federation functions it will be a sharp critic and quite open-minded in regard to making those criticisms and not make apologies for them as the program of the forests develops. We are a large area, and we want to so manage it that we will integrate into this picture all the sectors that should be included. Your chairman was down for a speech, but that is all of the speech that he intends to make.

I reserve for myself the right to submit a paper for the record.

Paper by Mr. F. A. Silcox, Chief of the United States Forest Service

Wildlife Management on the National Forests

(By F. A. Silcox, Chief of the Forest Service, United States Department of Agriculture. Delivered at the North American Wildlife Conference at Washington, D. C., on the afternoon of Thursday, Feb. 6, 1936)

The national-forest system now includes 154 units in 37 States, Alaska, and Puerto Rico. It embraces parts of every major mountain system and forest region of the United States. All resources within its boundaries are protected and conserved through use in the interests of the greatest good to the greatest number of people in the long run.

Wildlife is one of those resources. In Montana 82 percent of all big game is dependent upon national-forest forage. In the West as a whole, almost 75 percent of the remaining big-game ranges are now within national forests. Many of those ranges are, it is true, also used by domestic livestock. And national-forest visitors, fishermen and hunters included, increased from 3 million in 1917 to 37 million in 1935.

But despite these things, the number of game animals on national forests has increased 100 percent within a recent 12-year period. And present numbers are on most national forests capable of still further augmentation without destroying that measure of security which the use of timber, forage, and other national-forest resources bring to more than 1,000,000 dependent people in nearby communities.

It is fortunate that this is so. For as civilization's demands and restrictions increase, the national forests must become a still more vital factor in helping to preserve to the public that vanishing American ideal, the privileges of the hunt. They must, too, help maintain the opportunity freely to enjoy these aesthetic, scientific, and social pursuits which center around wildlife resources. They must through planned land use also play a greater part in restoring and perpetuating an economic resource the total national value of which has been estimated at more than $1,000,000,000 annually. And with an enlarged forest-land acquisition policy in the East, the South, and the Lake States, the national forest system must and will bring these benefits nearer to our larger centers of population.

Many of the relationships of forest lands to the problem of planned land use are much better understood now than they formerly were. There is a growing appreciation of the fact that forest lands constitute nearly one-third the total land area of the continental United States; that forests, as products of the soil, are susceptible of renewal and management; that maintenance of forest and forage cover helps prevent erosion and is vital to supplies of water for domestic use in cities, for the generation of power, and for irrigation.

It is only recently, however, that the public has been conscious of some, but not all, the many close relationships which exist between forests and wildlife. There is realization that forested and wooded lands of this country now provide all or a large part of the habitat for a major part of our wildlife, excepting only the migratory waterfowl and certain upland game birds. It is, on the other hand, neither widely known nor well understood that adequate management of forests and woodlands contributes definitely and directly to wildlife welfare, while forest exploitation depletes it.

This is unfortunate. For although forest management is practiced on the national forests, forest exploitation is still the rule on privately owned forest lands in the United States. So, with four-fifths of all forest land in private ownership, hillsides are still being laid bare each year; new ghost towns and rural slums appear; added erosion occurs; more wildlife environments are destroyed; more and more wildlife disappears from lands which it once occupied.

It is imperative that this simple and seemingly obvious relationship between forests and wildlife be more definitely understood by millions of wildlife advocates, for real forest management over areas broader by far than the national forests is vital to successful solution of the problem of national wildlife restoration as well as to that of forest conservation.

Game management is also necessary if success is to crown efforts to restore and conserve wildlife. To the layman, game management probably conjures up thoughts of closed seasons, bag and creel limits and game wardens; bounties on coyotes and other predators; streams and other water closed to fishermen; refuges, preserves, and breeding grounds closed to hunters. But years of experience on the national forests indicate that modern game management is broader than all this.

It comprehends, for example, such problems as restoring old, improving present, and creating new wildlife environments; maintaining a proper balance between numbers and species of wildlife and the kinds and amounts of food and shelter which they require. And major requirements break down into many individual but closely interrelated problems. Let me illustrate.

Protection was the purpose which underlay the original theory of game refuges. In actual practice refuges often work the other way. Deer, for example, increase on them at first, but fail to drift to other regions even under hunger compulsion. The food capacity of the overused area is therefore quickly exceeded. One inevitable result is starvation. Another is serious damage to the food supply. A third is reduction of wildlife population, often for long periods of time. This is what happened on the Kaibab Plateau, where starving deer deliberately have been reduced because forage was so badly

damaged that it may be 50 years before vegetation can again safely support a normal wildlife population.

Similar action has been necessary on a certain large. mountainous area on the Gila National Forest. Instead of a nearby game refuge, the immediate cause in this case was excessive protection to game by destruction of mountain lions. The inevitable happened. Deer increased so prodigiously and stuck so closely to their original range that it became necessary to remove surplus deer in order to bring back vegetation and retain the semblance of a healthy herd. California's coast range mountains are now under-populated with deer. The cause is the reverse of that in the instance just cited. Here, because of an underkill of predators, mountain lions have increased so rapidly that they have materially reduced what until recently were large herds of deer within striking distance of San Francisco and other bay cities.

Artificial planting of game often precipitates an unbalance between numbers of wildlife and the feed which must be available if wildlife is to exist. The national forests afford a number of cases where planted herds of elk and deer have in a comparatively few years outgrown the available winter range. Starvation, plus serious losses to agriculture by raiding nearby orchards, gardens, and haystacks, have followed.

Another problem in game management has to do with environment and land ownersip. Both scientists and sportsmen now see that in wildlife as in forest management a deliberate and constructive manipulation of the environment can be assured only by the landowner; that the private landowner must be given an adequate incentive for maintaining a favorable environment on his land or be given control of wildlife on it; that since wildlife is directly concerned with all other land uses, wildlife management on Federal lands must be closely coordinated between State and Federal agencies.

Food is, of course, essential both to wildlife and to domestic stock. Without forage, neither can exist. Broadly speaking, forage on strictly summer ranges in the national forests is ample to support, during summer months, many more animals than now use it. A radically different situation exists with respect to the winter ranges. They are not, as a whole, used by domestic stock but they are, nevertheless, so inadequate and many of them are so overgrazed that winter range is probably the biggest single factor which now limits production and conservation of national forest wildlife.

It must be remembered that the original home of much of our big game was on prairies and in valleys with little or no snowfall. With most of those prairies and valleys now fenced, pastured, and plowed, wild game has been forced into the mountains. Those mountains, now within national forests, are covered in winter by snow so heavy that in hard winters in Montana, for example, less than 5 percent of the area can be used as winter feeding grounds. As a consequence, some 70 percent of Montana's big game is forced to leave the national forests for a period of 2 or 3 months. It goes to nearby overgrazed land in private ownership and nearby depleted public domain. And since no other areas are available to it, deaths by starvation and illegal hunting are inevitable.

Except in Arizona and New Mexico, about two-thirds of the winter range in all States is outside the national forests. The zone, generally along the lower foothills, includes some 6,000,000 acres of private lands and 14,000,000 acres of public domain. This area, which does not have national-forest status, is eminently suited to the production of wildlife. It is a key to adequate management of wildlife which uses adjacent national forest ranges for 9 to 10 months each year. It should be added to the national-forest system.

National-forest forage now helps support, largely during the summer months, about 1,400,000 cattle and 6,000,000 sheep. This domestic stock is owned by some 26,000 people. Their social and economic welfare depends in real measure upon this use of national-forest forage. This presents another problem which directly concerns wildlife management: That of coordinating the supply of forage with the total number of domestic and wild animals dependent upon it, for good business, as well as for the fundamental purpose for which national forests were created, dictates that the supply of forage be maintained for the use both of domestic stock and wild game. It is evident, therefore, that a practical approach is essential in the matter of wildlife management.

I have sketched a few of the many problems that are involved in wildlife management on the national forests. An adequate organization is necessary if they are to be solved successfully; if the Forest Service is to devise and apply principles and practices of wildlife management to areas that already total some 221,000,000 acres gross in 37 different States and two Territories. Such an organization is now being assembled. It will, I am glad to announce, be directed by Dr. Homer L. Shantz, who has accepted appointment as Chief of the Division of Wildlife Management in the Forest Service.

Dr. Shantz has always been intensely interested in the conservation of American wildlife. He has followed biological, botanical, and Zoological lines of work throughout his career as a scientist and educator. He has recently resigned the presidency of the University of Arizona. His appointment in the Forest Service will become effective June 1, 1936. We feel fortunate in having secured his service.

Wildlife organization plans also call for the appointment of one qualified man in each of six of our regional offices and one on each of 100 important wildlife forests. Their entire time will be devoted to development of wildlife plans and supervision of the work on the ground. A mobile force of some 200 men to supplement existing law enforcement personnel and to be available on short notice to work in critical areas is also contemplated.

Stream survey work is scheduled for early completion as a part of the national forest wildlife management program. It probably will be followed by improvement of some 30,000 miles of streams and the installation of fish hatcheries and rearing ponds. This entire project is in cooperation with the Bureau of Fisheries.

Another project, in cooperation with the Biological Survey this time, comprehends as rapid extension as is practicable of our game surveys. A third embraces improvement of wildlife environments

where such work is necessary and advisable; by erosion control, by increasing the protection force, by wildlife plants where conditions justify them, by rodent control, reseeding and other methods of improving forage conditions. Silvicultural methods used in harvesting timber and in slash disposal, and forest regeneration, will be balanced and harmonized with this project. Modifications of management plans both for timber and wildlife will often be desirable and possible.

Knowledge of wildlife and its environments is of course basic to all these projects. Many efforts in protection and restoration have failed in the past because of lack of it. We realize that present information about wildlife population and kill (by predators and by man) is far from complete. Fundamental research in regard to the interrelationships of wildlife, its life histories, breeding and feeding habits, and diseases is still needed. Research is therefore another national forest wildlife management project. Plans include provision for Biological Survey research stations and Bureau of Fisheries demonstration stations in the field.

A vital part of wildlife management effort by the Forest Service is to maintain our whole organization as a sensitive, democratic, highly decentralized institution, working always with States and organizations on the ground. The Forest Service firmly believes it is essential that all its work be tied and integrated to local communities and interests, and I pledge that in getting the facts and in presenting them, action will always be taken on a cooperative rather than a bureaucratic basis.

Wildlife has served man throughout the ages. It has provided him with food and clothing. It was a vital factor in the conquest and upbuilding of the West. It represents, even yet, a direct annual income running into almost a billion dollars. Destruction of insects by birds saves added millions to national agriculture each year.

In the United States the numbers and species of wildlife once were legion. Now numbers and species have dwindled; pastures have replaced prairies; forests are exploited and forest lands burned; "no trespass" signs dot the land. But lovers of camera, rod, and gun from city, village, and farm still get the thrill of their lives at the sight, of song, upland, and shore birds, or fur bearers and small game and large.

All national-forest resources are perpetuated through use in the interests of the greatest number of people in the long run. Wildlife is one of those resources. People devote time and money in searching for and enjoying it; they are determined, now, that wildlife shall be restored and conserved with due regard, always, to other uses of other national-forest resources and the social and economic welfare of dependent communities.

The Forest Service of the Department of Agriculture recognizes the obligation. Through application of modern game management and with the cooperation of Federal, State, and other organizations, it will do, on the national forests, everything that can be done successfully to accomplish the common objective.

(An address by P. S. Lovejoy, Michigan Conservation Commission, Harmonizing Conflicting Interests in Land Management, was not read but was submitted for the record.)

Harmonizing Conflicting Interests in Land Management

(By P. S. Lovejoy, Land-Use Planning, State Conservation Department, Michigan)

There has been much such harmonizing with three well-tested ways to manage it: Club, compromise, or compensation—knock 'em out, talk 'em out, or buy 'em out—usually with a mixture of the three to get the best results.

These problems are very ancient. The cave dwellers seemingly ganged up on the Neanderthalers so as to get their own way of occupying lands. The Iroquois and Algonquins differed in their theories of how to manage the natural resources of the Great Lakes region. The French and English were presently tangled over the same question, and, having suppressed the reds, segregated them on lands considered worthless to the whites. But when those lands unexpectedly developed resources wanted by the whites the treaties were disregarded and pro-bono white.

Conflicting interests among the whites continued and intensified. The placer miners of California spread their tailings over the fertile bottom lands below, and the farmers fought the miners over that. Sheep and cattle men tangled over range allotments and fought wars which never settled anything save locally and pro tem. As the first national forests were being established, all the local contingents often ganged up to keep the forest rangers out. And so one * * * very ancient, very human, very real; one group, theory, and practice being replaced by some other—and seemingly without end to that sort of shifting.

We may do well if we proceed upon that assumption: That Homo is incurably optimistic about his ability to retinker his habitats into more satisfactory combinations.

The prime difficulty, of course, arises from the fact that the different nations, tribes, groups, and individuals have different definitions of the correct objectives and ways and means for reaching them; and in that they so often change their minds concerning both.

My assignment is to canvass those objectives, and the ways and means for getting them decently stabilized and going parallel instead of crosswise. For that we have some precedents.

No such controversy could well be more acute—without developing into civil war—than the manner in which the western stockmen received the National Forest regulation of grazing. Having run out the "buffaler and fit the Injuns", and made it a white man's country, no white-collar dudes from back East were going to learn the stockmen and their neighbors how to run their own country. If they tried it, there would be ranger bones whitening in the gulches, directly * * *. But within about 20 years, all that had been almost forgotten. The conflicting interests had been pretty much harmonized. The way of that may stand some consideration.

Behind the rangers stood Washington and the Supreme Court. That was the club effect; but there was in it also, a large element of compromise. The rangers said to the sheep and the cattlemen: "Come on now * * * there's only so much range here, and it will carry only so much stock, and it's gotta be divided up somehow * * * git together, you fellers * * * its more your

22854A

A, Snowshoe hare in the Roosevelt National Forest, Colo. (Forest Service photo.)

211762

B, Male elk in the Olympic National Forest, Wash. (Forest Service photo.)

17755A

A, Wild ducks on a stream in the Wichita Mountains Wildlife Refuge, Okla. (Forest Service photo.)

B2446M

B, Ward's heron on its nest near Indian Key, Fla. (Biological Survey photo.)

country than ours but iffen you don't git together an' do it fer yourselves, outsiders are a-goin' to do it anyhow—an' probly wrong * * * So git together, why don't yah?" There the element of compromise came in.

When the stockmen replied, asking "Why should we? What's in it for us?" there was an answer. The rangers said: "Why you git the feed for your stock, of course, and you will know in advance that you are going to git it. You git feed and undisturbed possession * * * Yore women folks, they won't hafta worry so much when the boys are out on the range." Therewith came the element of compensation; and in that compensation there was a tangible economic phase (dependable supplies of forage), and there was also a social phase, intangible but very real. That manner of range management in the mountains, made for a safer, more pleasant living for the people of the valley ranches.

Behind all this, tempering and conditioning all the actual contacts and adjustments, never conspicuous but always there, was the instruction from Tama Jim Wilson, Secretary of Agriculture. To the new Forest Service he had said: "In working out the local conflicts of interest, keep trying to make 'em break for the greatest good of the most people—in the long run."

There, perhaps, we have something approximating a formula of very general application—a sharp definition of distal objective, plus a mixture of club, compromise, and compensation. But this will be easier to write than to apply.

When the engineer has a job of designing a given structure or machine, using given materials which he does not fully understand, he puts typical samples into his testing machines and loads them until they fail. He notes the places and manner of those failures, and presently designs accordingly.

I am wondering whether we have not had enough conservation controversies, and enough failures, repeating over and over in the same ways and places, so as to permit us something of the engineer's procedure. If we find that similar frictions and failures are typically taking place and are increasingly predictable, then, seemingly, we should be able to design and operate our conservation affairs accordingly. Where then and how, have we been jammed or broken?

Waterfowl.—With a variety of adverse factors long and obviously working to their detriment, supplies and availabilities steadily shrinking, nobody accepted the responsibility for getting and for translating the essential facts. Nobody was in good position to do this. Whatever the reasons it wasn't done. The first decently competent and comprehensive text on waterfowl management has just been published, and—make a note—it came from a State conservation department, and not from a Federal bureau.

If a Ding Darling had happened along 20 years ago, preaching and praying as Giff Pinchot preached and prayed his timber-famine doctrines, what might have happened?

Or shall we say that our waterfowl affairs are just now in about the status our forest affairs were 20 years ago, and that given a normal supply of prophets crying in the wilderness, and one or

another Roosevelt in the White House, such things will somehow get taken care of?

Or shall we say that, really, our waterfowl aren't so very important one way or the other * * * and remind ourselves how pleased and excited we were 30 years ago when the reclamation prophets began to make the deserts blossom as the rose—to fruit out, presently, into bankrupt irrigation projects. Perhaps our waterfowl affairs are not yet ready for analysis, but many other conservation doings assuredly are.

Olympic elk.—Here we have an old national forest in some very noble mountains surrounded with privately owned timberlands, and with a central core of a national monument, in theory created to save the elk. In fact the elk would be in the high country only during the summers when they needed no such protection, and would be in the lower valleys far beyond the monument boundaries and even beyond the forest boundaries during the winters and while they might need special protection.

Even under the very sketchy protection actually supplied by the State and Forest Service, the elk increased until, by 1935, they had begun to press hard on the supplies of winter browse. Meanwhile the National Park Service had acquired jurisdiction over the monument. If very materially enlarged, the monument would have the makings of another national park, perhaps; and elk or no elk there was—is—no love lost between the Forest and Park Services.

Both Bureaus, of course, have their own tablets off the mount. Each worships as per its own organic act; the one before the altar of the sacred primitive, must save Nature for God and the fat lady from Kansas; the other places its wreaths before the altar of the sacred sawlog and chants Tama Jim's litany, praying for enlightenment.

Now the State game authorities open a short season on the elk and the power comes on. A stray mammalogist spends a few days on the Peninsula and makes a report to a New York Club. This report finds the elk to be very nice elk, indeed, and that they are in considerable trouble, and that only the Park Service is to be trusted to properly cherish elk like these.

Promptly thereafter, the emergency conservation association (of New Jersey) goes into action and circulates a Circular of somewhat frenetic tempo, mentioning the elk, picturing the ferns nestling among the primitive fir trees, and specifically suggesting large and early transfers of national-forest lands into national-park status. Whereupon the local chambers of commerce begin to throw a barrage, asking, in effect, whether the local lumber industry is to be jeopardized or wrecked in order to assuage the aesthetic yens of a few people back East?

In 1935 a high official of the Interior Department is loudly complaining that the Department of Agriculture is using its field men to conduct a nefarious pro Forest Service lobby. Early in 1936 national park field men are soliciting State conservation departments to endorse to their Congressional delegations, a certain very wonderful bill. The Forest Service meanwhile, is soliciting testimonials for another very wonderful bill—the two bills being nicely calculated to cut each other's throats; and meanwhile there are hungry elk in various National Forests and National Parks.

Do several elements in that summary seem quite familiar and typical of the disharmonies and conflicting interests in land management?

Saginaw Valley.—Here is a smallish river flowing into a bay of Lake Huron. Two considerable cities are located on the river near the bay. Originally saw-mill towns in cut-over country, the towns are now manufacturing, and the surrounding country is dominantly in farms.

Sugar beets are a major product of the farms, and the sugar plants discharge their wastes into the river. Along with creamery and tannery wastes, and byproducts from a big chemical plant, these wastes go downstream to the distress of the people in the cities, who depend on the river for their domestic water supplies.

Now oil fields have been opened in the valley, and to recover the gas and oil it is also necessary to take out great quantities of concentrated brines, which presently reach the river.

These compounding pollutions have now contaminated the water supplies of the two cities so as to make their situation almost intolerable. They might, perhaps, use a State pollution-control statute and enjoin the whole list of polluting agencies. But what would the farmers then do for a market for their beets and milk? What would become of the people in the town which is dependent upon the big chemical plant? Must oilfield development stop? And who does what to pick this back-lash free?

Every State, every county and almost every township or farm or town will have an infinite variety of such tangles and disharmonies, and those which do not involve wildlife affairs, will often be more urgent than those which do. Any formula or procedure calculated to be of general application, must evidently be broad and must get down to fundamentals.

I shall offer no such formula, but I am suggesting that various items or terms in the equations, and repeating over and over again, and that it will not be good engineering to take them for granted or to ignore them.

In most or all such cases, for instance, the individuals or groups concerned, are strongly polarized to technical, economic, or to social considerations. Being so polarized, the people and groups are, in effect, blind to the other components of the complex.

This works out, perhaps, as in the case of alfalfa. Everyone has long been agreed that alfalfa is a fine forage crop, and should be growing on more fields and farms. For a hundred years or so, that was known and said and believed and tried. But the alfalfa plant could not be depended upon. Sometimes it "caught" and did well, and often it straggled or failed entirely, no one knowing why. But then the experiment stations went to work to find out why. Their job was to identify the limiting factors; then to get them under control. They did it. Today we know that to do well, this crop must be started from properly acclimated seed, must have a deep, well-aerated soil, must be inoculated with the right strain of nodule-forming bacteria, and must not lack for lime.

These are primary and permanent limiting factors and each of them, and all of them together, must be properly attended to, or the crop will fail—will always fail. To attend to three of the factors and neglect the fourth will result in futilities.

Might it be something of this sort which underlies the frictions and failures which so frequently develop in our conservation affairs? Does it seem probable that the technical, economic, and social phases contain the limiting factors of the conservation equation? If so, we must evidently get each of them well tended to, and tended all at once—or be prepared for endless blind-alley futilities and water-bug skitterings.

On such a theory, my job is to try to identify such perhaps-prime factors, and to prospect the chances for getting them adequately buffered down.

Experimenting with such a notion, how does it seem to check with our test samples?

The national forest grazing regulation seems to have worked out to a good balance; did it show a well defined technical phase? It did indeed. From long before Abraham, the handling of livestock on the ranges had been empirical. Within a few years after the technologists had been put to work on it, a range technology directly comparable to those of the standard crops, proved entirely practicable, and was feeding into actual practice. As is was developed and applied, more dependable and better forage crops resulted, so that given ranges could yield and hold up where they had been failing or deteoriating.

More stock could now be safely carried on given ranges, and thereby the economic phase was served. Presently preference was given to local ranches which cut enough hay to winter their stock without gambling with the blizzards; and that made for economic stability; and thereby the social phase was served. With the mountain ranges holding up and now directly linked with the long-run interests of the valley ranches, those districts became better places in which to live—and keep on living.

In this case, then, our tentative formula seems to work out.

How about the waterfowl case? Still very sketchy, it will certainly develop an elaborate and valid technology, with limiting factors increasingly understood, and controls therefor increasingly available. And it has also large economic and social phases.

But how large and how potent in our equation? And how linked with the fixed biology of the genera and species to be worked as crops? Are there, for instance, enough people enough interested to find it worth their while to buy enough licenses and enough stamps to generate a dependable income adequate to carry the essential work? Will the resulting yields of the species under management be generous and dependable and satisfactory enough to make the operations indefinitely self-supporting? Or are we, perhaps, up against a proposition similar to the joyful irrigation of our deserts on a revolving fund which presently stopped revolving?

Shall we then say that while we are strong on the technical we seem to be somewhat weak on the economic phase of waterfowl affairs?

And social? Well, shall we agree that public funds may properly be spent on public works only where the general public is asured of the resulting benefits and increments, and that such considerations are basic in the social phase? Then how shall we figure in the private duck clubs which today have control of such a heavy percentage

of the choice marshes? If there is an increasing jam at that point, then we must evidently find a way to buffer the social considerations in order to strengthen the weakness in the economic term. If the set-up begins to look like special privilege, and if the public decides it won't stand for it, what becomes of our waterfowl program and all its excellent technology? Or do we perhaps lime that sour spot by clubbing, or by buying out the clubs? In any case, the worst sticker would seem to be in the social factor, with the economic rather gummy and only the technology free running.

In the case of the Olympic elk how does our tentative equation seem to apply? Here also the technical phase would seem to be relatively easy. The certainly available ranges will carry about how many elk through the bottle necks of the winter periods? Given fair protection, the herds should increase about how fast? The annual throw-off will then be about what? Increases beyond safe carrying capacities might be disposed of how? Rifle? Live-trap and transfer? Cougar and wolf encouragement? But such management operations, even though no more land need be purchased, will take men and money, so how are we fixed in the economic?

Would the sale of hunting licenses carry the costs of operating? Might there also be a visitor's fee for going into the elk country? Could the sale of cast antlers mounted in fake heads be made to pay? Might somebody pay real money for live-trapped breeding stock? Would the sum of all such elk income balance the costs of maintaining the herds? If not, do we cheerfully ante the difference just to have some *Cervus rooseveltii* somewhere in case we need some for something? Our economic, evidently, is rather weak, so how about the social?

That, seemingly, is in very unhappy status. A highly articulate contingent is alleging that the elk are much more valuable as garnishings for the precious primitive, than as meat and trophies; but the hunting contingent pays license fees and wants trophies—and is numerous and apt to vote. It is quite sure, of course, that if properly managed, there might be elk enough to take care of both contingents fairly well, but when feelings are involved, what citizen reads a bulletin to find out how to vote?

Our social factor seems to be splitting up. It will, obviously, have a political aspect whenever considerable group interests get tangled and "feeling strongly" for or against a condition or proposal. So now we must evidently write into our equation some term to take care of homo "feelings"—emotions—psychological reactions not much, if at all, dependent upon mere logic, reason, or laboratory fact.

The earnest Waltonian, reciting to his brethren how he reacts to the barking of old Spot, as the shells slip into the old Parker on a frosty morn as the quail season opens; or reporting on the detail of his procedures as he managed to transfer a superannuated bass from a stand of Potomageton into a boat, will be vibrating in the emotional plane as truly as will the S. P. C. A. lady lamenting to her sisters over the hideous cruelties of the steel trap and the barbarities of bloody shot.

At any place in our equation, the emotional factor may at any time become the dominant among the limiting factors, and for that we have poor—if any—technique of buffering or controls. So let us write in a "plus or minus X" as an exponent of our social term; and let us say that the Olympic case is badly tangled in the social, that the economics of it are distinctly gummy, and that none of the three official outfits now involved—two Federal and one State—have demonstrated that they are fit to be trusted with such a combination.

In the Saginaw Valley case we are evidently jammed and gummed in the technical, the economic, and the social. No existing agency or machinery is competent to untangle such a combination. We waited too long before we took the patient to the hospital. Nothing but some manner of amputation offers hope, but patient and family will not yet consent, so the surgeons must wait, treating symptomatically the while.

If, with these illustrations, we may now assume that in any typical conservation complex, we shall always find a mixture of technical, economic, and social factors, and that in working out satisfactory or permanent solutions we must expect to proceed as we did in putting the alfalfa crop under control, with the limiting factors properly identified, and with controls for each, and all to be handled at the same time, and that the conflicting interests will not be or stay harmonized until this has ben managed, we shall have roughed in a thesis as assigned.

What then, in the way of tools and technic, is available for tackling such jobs in such a way? Our present kit, I judge, is not too good.

We have to be sure, a great and rapidly growing set of technologists, but they are seldom to be trusted with jobs like these. In the nature of the case the typical technologist is an enthusiast, and lopsided accordingly. Turned loose to do his stuff as he wants to, he carries his wreaths to his old altars and keeps his fingers crossed while he prays for enlightenment. The drainage engineer drains, the irrigation engineer irrigates, the forester plants some more pine, the landscaper scapes, the gamekeeper tries to enlarge his rearing fields, and the hatchery man his ponds, and all of them try to get their hands on more lands and waters so as to expand their specialties, each, meanwhile, entirely sincere, no doubt, just as the agricultural technologists were sincere and enthusiastic in their conviction that we couldn't have too many farms or farmers.

So the technologists will normally oversell their specialties, and are apt to do a poor job of driving. Being color-blind, they are not to be trusted to know when the lights are changing.

So also, our businessman contingent is due to be color-blind to the technical and social, and therefore hardly to be trusted to do our driving.

For the social, with its various phases, the political is the only machinery which seems yet well developed, and the technical and economic contingents too often forget that it takes as long to develop a really clever politician as it does to make an engineer or wildlife pathologist; and that the politician is the only professional whose chief business it is to contrive ways and means to harmonize

conflicting group interests, and that such conflicting interests are presumably normal and inevitable so long as Homo continues optimistic as to his ability to tinker and retinker his habitats into more satisfactory combinations.

The essential, I take it, is to locate our limiting factors and then put them under control. I am guessing that the bulk of these limiting factors will be located among technical, economic, and social complexes, and that unless they are correctly identified, and buffered at the same time, our "conservation" affairs will continue gummy and backlashed.

I am guessing that we need a personnel of a new sort or slant, to do for these conflicting land-use affairs, what the county agricultural agents have been doing for the orthodoxies of farms and farming and farmers, but who will see the job full-circle instead of by segments, with lands and waters and the wise and proper utilization thereof—farms, forests, or recreational coordinate and to be balanced up long-run pro bono homo, as the same may appear.

Such conservationists, I presume, will be trained and experienced in the uses of club, compromise, and compensation, and they will understand that the enthusiast (amateur or professional) will be trying to take people where he thinks they ought to go; that the nothing-else-but politician would take them where he thinks they think they want to go; but that the real job is to so devise and contrive that the people shall be taken where they will be glad to be when they get there.

Remarks of Chairman F. A. Silcox

Chairman Silcox. My particular function as chairman of your conference is coming to a close. Before I get down off the platform and pass the scepter to "Ding" Darling, who now has as your acting president the job of carrying the banner—and we know how good a banner bearer he is—I want to express my personal appreciation to those men who have worked behind the scenes. Those of you who have attended conferences know the enormous amount of detail that is involved in arranging for the auditorium and arranging meeting places and the banquet and the printing of the program, getting hold of speakers to list them on the program, the readjustments that have to be gone through, and all of that infinite amount of detail that has been carried on so excellently by the working committees who haven't appeared and have gotten very little credit for the very valuable work that they have done, and if it had not been done the conference would have run at sixes and sevens.

Among those, first of all I want to pay my respects and appreciation to the special committee of citizens who responded to the President's call, who acted in the early part of this conference as advisers for getting it under way. They include:

Mr. Elliott S. Barker, New Mexico.
Mr. Frank T. Bell, United States Bureau of Fisheries.
Mr. Arno B. Cammerer, National Park Service.
Mr. Charles E. Clarke, Jr., Florida.
Mr. Powell Crosley, Jr., Ohio.
Jay "Ding" Darling, Iowa.

Mr. William L. Finley, Oregon.
Mr. Ira N. Gabrielson, United States Biological Survey.
Mr. H. S. Graves, Connecticut.
Mr. John A. Hartwell, New York.
Mr. J. K. Kinnear, Ohio.
Mrs. Roberta C. Lawson, Oklahoma, the president of the General Federation of Women's Clubs.
Mr. E. S. Martin, New York.
Mr. David C. Mills, Connecticut.
Mr. Nathan Moran, California.
Mr. Frank E. Mullen, New York.
Mr. Edward A. O'Neal, Alabama.
Mr. I. T. Quinn, Alabama.
Mr. Kermit Roosevelt, New York.
Mr. L. J. Taber, Ohio.
Mr. C. A. Wheatley, Texas.
Mr. George W. Wood, Iowa.

A committee brought together as an advisory committee to get this plan under way.

I also want to express my personal appreciation to the group who have worked behind the scenes, as I have said: Mr. Davis, Mr. Gordon, Mr. Shoemaker, Mr. Grabrielson, Mr. Henderson, Mr. Palmer, Mr. Rachford, and a group who have been inside working out the general details of this program. I want to extend my own personal appreciation to them, because, as I say, a lot of things which have clicked along would not have done so had not their arrangements been well made.

I am going to turn over the scepter to your elected president, but I want to add one thing more, that in the background of this has been the generous cooperation of the Wildlife Institute, and I want to express my personal appreciation to them. I remember when this thing started and I was coming back from the West and had a notice that I was appointed chairman, having had no opportunity to say whether I would or wouldn't, coming back here and finding practically the necessity for setting up an entire organization for this conference and a method of financing it.

The president made a very clear-cut and definite statement when he made this call, and that was that this must be a general public meeting in which no particular agency was in the picture as its dominant factor. The Wildlife Institute stepped aside at the beginning of this conference and recognized that particular necessary public policy on the part of the president, but in stepping aside in the picture they generously helped, and generously assisted in financing this conference, which was impossible otherwise. We have attempted to make available certain Federal funds out of a deficiency appropriation which will reimburse those private agencies who have helped contribute to this particular conference. I make that statement in fairness, I think, to the Wildlife Institute who have distinctly helped in making this whole program possible.

Now, Mr. Darling, I want to turn over the scepter to you as the acting president of the new federation. He needs no introduction.

Jay, God bless you, the baby is yours now.

Remarks of Mr. Jay N. Darling

Mr. Jay N. Darling. Chairman Silcox, you should say "God help you!" [Laughter.]

It is with a good deal of regret that I come to the platform for the last time at this conference. If I could have foreseen a week ago that this conference would have resulted in so much good, so much elimination of friction, drawing off of the poison elements and misunderstandings, I could hardly have believed it.

I stood at the door of this hotel today and said goodbye to many of the departing delegates—all going out in peace and harmony with a smile on their faces. The predicted explosions of factional warfare did not appear. [Applause.]

That has been a tremendous step forward. There have been some momentous accomplishments of which to make record during this conference. I wonder if you realize what a big package Senor Jaun Zinser, the delegate from Mexico, brought to this convention. The signed treaty with Mexico is a dream come true! [Applause.]

We have been looking for a Messiah ourselves, and in our neighbor we find one with the work well in hand and going forward, and probably with much less support back of him than exists in this country. Here is a man, who, single-handed, had done a heroic job and done it well. He has brought the International Treaty to fruition. [Applause.]

We are now in accord, the North American continent is unanimous in the restoration program, and it was with great satisfaction that those who had looked forward to this treaty with Mexico supporting and augmenting the continental control, heard that it has been signed and made a matter of record. I see no obstacles in the way of ratification by the United States Senate.

I wonder if you delegates fully appreciate how much it means when Chairman Silcox says that the Forestry Department has set up a separate game division for the 180,000,000 acres under his administration. That is another step forward, a seven-league-boot step. It is a big one. While I think they have always had their aims and sympathies in the right place, it remained for the administration of F. A. Silcox to put the impulse into action.

Another tremendous step that has been accomplished and recorded at this conference is the coordinating agreement between the Reclamation Service and the Biological Survey—a long and destructive battle ended.

And now, coming to our own federation, if we can go back to our States and complete the job for which we have just sown the seed our happiness will be complete.

Don't overlook the fact, however, that there is no more hope of this federation succeeding by what we have done in Washington than there was for any other project in the background which has died of malnutrition. It receives its strength from the soil and the people on the periphery of this country. When you go home, if you do not complete the job of federating the units in your localities, in your counties, getting them to pull together for the common interest, the federation project will have failed.

I have heard today many questions: Why was the word "primary" put in there? That refers to that sentence, "Organizations primarily interested in the conservation of wildlife." I don't know who put it in or where it came from, but the words in that tentative constitution mean nothing except as a framework for your consideration. Don't quibble over words. Join the federation and make it what you will. The best insurance of a successful federation lies in the hope that the constitution will be broad enough to include all conservation interests. It all depends on what you make of it in the future. There is nothing yet that is signed and sealed.

The question is asked also: "Who is going to finance this federation? Where are we going to get the money?" I don't know, but I do know that if the federation accomplishes for us even a few of the major objectives its value will be so readily apparent that financing will be a comparatively simple matter. Why, we waste more money every year in every State than it will cost to finance this whole federation. Until there is an authorized federation the work will have to be done by volunteers.

The thing of which I am most afraid is that you delegates will rest on your oars when you get back home and think the work is done. The work of actual federation is only just begun and we must generate our own power.

You have seen the evidence of the operations of the junior chamber of commerce all over the place in this preliminary organization. They should not be left out of the picture when we are passing around the bouquets. They have organized in many States the movement which brought down here to Washington the crowds which represented a number of the States. By the way the National Junior Chamber of Commerce operates efficiently on an annual budget of $16,000. Their operations are a good model for us.

We are not going to have any mahogany desks, and high-priced executives until we can afford them in this new federation. If we can't do it as cheaply as the junior chamber of commerce then we had better get them to run it for us. And $16,000 for a national wildlife organization divided among 48 States is nothing at all.

Having passed the flowers to everyone and tried to assure you that there are and have been no hidden motives in this conference (and I have looked under every bed and into every corner without finding any spooks).

I will close by saying that best of all is the spirit that you yourselves have contributed to this conference. I hope we may repeat it annually. With that word, goodbye. [Applause.]

It has been suggested that we should again call attention to the various representatives of the States that to the committees of five and their chairmen belongs the responsibility for carrying back and continuing the organization within their States. That has been emphasized a number of times; it seems as if we ought not to have to repeat it. The committees of five selected at your State caucuses are the ones we will contact, and through them we will negotiate with the States, we will send them any information they may need, and the chairman of that committee will be considered to be in authority until the Washington office is notified of a change.

Chairman SILCOX. I thought Mr. Darling after taking over the scepter would call the adjournment of this meeting. As my final

swan song as your chairman, I now declare the North American Wildlife Conference which has been in session from February 3 to today, inclusive, adjourned.

(The conference adjourned at 5 p. m.)

CONSTITUTION APPROVED BY THE GENERAL WILDLIFE FEDERATION, WEDNESDAY, FEBRUARY 5, 1936, AT WASHINGTON, D. C.

Preamble

Believing that the natural resources of this continent are economic, social, recreational, and esthetic assets which should be restored and perpetuated for our posterity, and realizing that this can be achieved only through an aroused and enlightened opinion among the people of this Nation, we dedicate this federation to these ends.

Article I. Name

The name of the organization shall be General Wildlife Federation, and shall be incorporated as a nonprofit membership corporation under the laws of the District of Columbia.

Article II. Objectives

The purposes of the federation are:

(*a*) To organize all agencies, societies, clubs, and individuals which are or should be interested in the restoration and conservation of wildlife into a permanent, unified agency for the purpose of securing adequate public recognition of the needs and values of wildlife resources.

(*b*) To develop a comprehensive program for the advancement, restoration, and conservation of wildlife.

(*c*) To present to the public such pertinent facts, discoveries, and information as may contribute to the solution of the problems involved in the restoration and conservation of wildlife.

(*d*) To cooperate with other general wildlife federations in other countries on this continent.

In the furtherance of the foregoing objectives, the federation is empowered to take such steps, engage in such activities and cooperate with the National and State Governments and such other agencies as may be helpful and necessary to these aims.

Article III. The Federation Membership

The federation shall be made up of one representative from each of the several States, the Territories, and the District of Columbia, selected as hereinafter provided. Nation-wide organizations and societies having their principal offices in the same region, and with the approval of the board of directors of this federation, shall be entitled to one representative for that region. Such representative shall be elected by the joint vote of the boards of directors or trustees of such organizations and societies.

Wherever the word "State" or "States" is used in this constitution it shall be deemed to include "Territory", "Territories" and "the District of Columbia."

The representative from a State must be selected by a general federation of interests whose primary purpose is the conservation of wildlife. Said representative shall be elected in the manner provided by the constitution and bylaws of the federation of that State.

Pending the formation of such a federation within any of the States, and until such organization is perfected and has made its own selection, an ad interim representative may be appointed from that State by the board of directors of this federation.

Article IV. Board of Directors

The board of directors shall consist of 19 members, 13 of whom shall be elected by the State representatives of the several regions. The Nation shall be divided into the following regions:

No. 1. Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.

No. 2. New York, New Jersey, District of Columbia, Pennsylvania, Delaware, and Maryland.
No. 3. West Virginia, Virginia, North Carolina, and South Carolina.
No. 4. Georgia, Florida, Mississippi, and Alabama.
No. 5. Tennessee, Kentucky, Arkansas, and Missouri.
No. 6. Ohio, Indiana, and Illinois.
No. 7. Michigan, Wisconsin, and Minnesota.
No. 8. Oklahoma, Louisiana, and Texas.
No. 9. North Dakota, South Dakota, Nebraska, Kansas, and Iowa.
No. 10. Colorado, Utah, Arizona, and New Mexico.
No. 11, Washington, Oregon, and the Territory of Alaska.
No. 12. California and Nevada.
No. 13. Idaho, Wyoming, and Montana.

The membership of the board so elected may be representatives of the States or they may be chosen from the citizenship of some State, but in all cases every member of the board must be a resident of the region which he is elected to represent; and upon his removal from such region shall cease to be a member of the board of directors.

In addition to the 13 members of the board of directors selected in the above manner, there shall be 6 members at large, not less than 3 of whom shall reside west of the Mississippi River.

The six members at large shall be elected at the annual conference of the federation.

The members of the board shall serve for a period of 3 years from the time of their election and qualification, except at the beginning 6 of them shall hold office for 1 year, 6 for 2 years, and 7 for 3 years, and thereafter as their terms of office expire they shall be elected for a 3-year term. The terms of office in the beginning shall be determined by lot.

The members of the board of directors representing regions shall keep the States within their regions informed as to the work, plans, and progress of the federation.

The principal office of the federation shall be in Washington, D. C. The board of directors shall hold its annual meeting on the third day of the annual conference, called under the auspices of the federation, at such time and such place in the city of Washington or elsewhere as may be fixed, at least 30 days in advance of said meeting.

The board may, during the year, hold such other meetings at such times and places as it may decide upon provided, however, that the chairman of the board shall call a special meeting upon written request of not less than 7 members of the board and upon 15 days' notice.

The duties of the board of directors shall be to direct the business of the federation; to receive annual reports from its officers; to promulgate these reports and to present to the annual conference a report of its activities during the preceding year; and to perform such other duties and engage in such activities as are necessary and proper to carry out the purposes and objectives of the federation.

In the furtherance of the objectives of this federation, the board of directors may accept donations of land, funds, and other aids to the development of its program.

Ten members shall constitute a quorum of the board of directors and shall have power to transact all business of the board.

The board of directors shall within 30 days after adoption of this constitution, provide itself and the federation with a set of bylaws, which shall be subject to amendment in the same manner as provided herein for the amendment to the Constitution, except that the bylaws may be amended by a majority vote.

OFFICERS OF THE BOARD

The board of directors shall choose from among its membership a chairman and vice chairman, who shall hold office for 1 year only, unless reelected by the board.

The board shall have the power to select a secretary who may or may not be one of its members. The person so selected should have an adequate knowl-

edge of wildlife conditions and be familiar with conservation organization activities.

The secretary shall hold office at the will of the board of directors and shall furnish bond in an amount stipulated by the board for the faithful performance of his duties as secretary.

The board shall select annually a treasurer whose duties are hereinafter defined. The treasurer shall furnish a bond in such amount as the board may stipulate for the faithful performance of his duties as treasurer.

Article V. Officers of the Federation

The federation shall elect annually, at its conference, a president and three vice presidents, all of whom shall be members ex-officio of the board of directors.

The federation, at its annual conference, may, if it so desires, elect a president emeritus, recognizing some individual who has rendered a conspicuous and outstanding contribution in the field of wildlife.

Article VI. Nonaffiliated Membership

In addition to the representatives who shall make up the General Wildlife Federation, individual memberships may be obtained by persons and groups not affiliated with any of the other groups, societies, or clubs which make up the county and State federation. Such memberships may be obtained under rules and regulations provided by the board of directors.

Article VII. Executive Committee

The board of directors shall appoint from among its own members an executive committee of seven members which shall have such power as may from time to time be delegated to it by the board of directors.

A majority of said members shall constitute a quorum. Vacancies in the executive committee shall be filled by the board of directors. Vacancies in the board of directors shall be filled by the remaining members. Persons so selected to fill vacancies on the board shall hold office only until the next annual meeting of said board, unless reelected as herein provided.

Article VIII. Finance Committee

The board of directors shall appoint a finance committee of seven members which shall be selected from the membership of the board of directors, four of whom shall constitute a quorum. The finance committee shall have the power, and it shall be its duty, to recommend the method and devise the ways and means for securing adequate revenues to finance the operations and activities of the General Wildlife Federation, including the cost of the annual conference. Within 30 days after the adoption of this constitution, the finance committee shall present to the board of directors a plan for such financing.

Article IX. Other Committees

The board of directors shall appoint a program committee, which shall have in charge the preparation of the program for the annual conference of the federation, the issuance of the call for said conference, and all of the details incident thereto.

The board of directors shall appoint a legislative committee which shall cooperate with the States in legislative programs and assist in bringing to the attention of the National Congress the needs and requirements of wildlife.

The board of directors shall appoint a planning committee, which shall assist in developing a wildlife restoration and management program. The planning committee shall present its data and conclusions from time to time to the board for distribution to the public and interested agencies.

The board is empowered to appoint such other committees from time to time as the need for them arises.

Article X. Other Officers and Employees

The board of directors shall have power, in addition to employing a secretary, to employ such other special-service assistants, officers, and clerical assistants as from time to time may be required to carry on the work of the federation and render the service for which this federation is formed. Neither the president nor the vice presidents of the federation, nor the chairman or the vice-chairman shall receive any compensation, except for expenses authorized or approved by the board of directors.

The board shall fix the compensation of all its officers and employees.

Article XI. Duties of the Officers

The president of the federation shall preside at the opening of the annual conference of the General Wildlife Federation and shall perform such other duties as are germane to his position.

The vice presidents of the federation in their order of precedence shall preside in the absence of the president and shall, in case of a vacancy in the office of president, succeed to that office.

The chairman of the board of directors shall preside at all regular and special meetings of the board, and shall perform such duties as the board may delegate to him. The vice chairman shall, in the absence of the chairman, preside at any meeting of the board, and shall have such powers and shall perform such duties as the board may delegate to him.

The secretary shall have such powers and shall perform such duties as the board of directors may from time to time impose upon him. He shall receive all moneys coming to the federation and shall, after entry on the federation's records, turn same over to the treasurer. He shall issue the call for all meetings, shall keep all records and otherwise conduct the affairs of the federation under the direction and supervision of the board.

The treasurer shall be elected annually by the board of directors. He shall receive from the secretary all moneys which are collected by, or turned over to, the secretary. He shall pay all indebtedness incurred by the federation out of said funds when evidences of such indebtedness are submitted to him with the approval of the secretary.

Article XII. Voting at Conference

Voting at the conference shall be by States, each State being entitled to one vote. Nation-wide organizations and societies shall likewise be entitled to one vote for such organization in their respective regions as hereinbefore provided. Representatives may vote in person or by proxy and it shall be the duty of the board of directors to require proper credentials from all who appear as representatives.

Article XIII. Amendments

This constitution may be amended in the following manner:

1. Not less than 60 days prior to the annual meeting, amendments may be proposed by any representative of the federation, or any county or State group, or any individual member by filing same with the secretary of the board of directors. Not less than 45 days prior to the annual conference, the Secretary shall transmit to the officers of the 48 State federations, and to such other national and individual memberships, copies of said proposed amendments. At the annual conference these amendments shall be submitted to the membership in attendance, and if approved by two-thirds majority of those voting, shall become part of the constitution.

2. Amendments to this constitution may be proposed at the annual conference of the federation and within 30 days thereafter shall be transmitted by the secretary to the board of directors to the State wildlife federations for approval or rejection. When the secretary has been advised by mail by the officers of two-thirds of the State councils that an amendment has been approved, he shall notify the board of directors, which shall in turn promulgate the amendments as a part of the constitution.

FARMER-SPORTSMAN COOPERATIVES

MONDAY MORNING, FEBRUARY 3, 1936

Chairman: W. C. ADAMS, Director, Division of Fish and Game, Albany, N. Y.
Committee: H. O. RUHL, Superintendent, Division of Game, Lansing, Mich.; CHESTER H. GRAY, American Farm Bureau Federation, Washington, D. C.; CAPT. H. J. BURLINGTON, Secretary, Board of Fish and Game Commissioners, Trenton, N. J.

The meeting opened with a short address by the chairman, as follows:

The problem is one of social adjustment; not a question of how far the landowner is going to be drawn into a working arrangement, but on what basis the landowner and all those who do not own land but want to go on the farmers' holdings to take wildlife—how they are going to work it out.

There is the application of wildlife management along with it. The whole terrain of the United States is capable of producing at least 100 times more wildlife than is on it at present. This is a very conservative statement. Proper game-management methods must be applied to produce this. Obviously the State will never have the funds with which to do the work. There is not a State in the Union today having sufficient funds to apply, in their entirety, the wildlife-management principles on the total amount of State-owned property, let alone privately owned land.

The second complicating factor is to what extent should the State go on to privately owned land, with personnel and funds, to do the job, thus giving the private landowner something for nothing. The rank and file of sportsmen think the taking of wildlife is a God-given right and is a privilege free as the air. We who have followed this along down the years realize that there never was such a thing as God-given rights in the American system of free hunting and fishing, and it does not exist today and will not exist in the future.

When we talk about it, it goes back to the privately owned land because in every State there is little State-owned land upon which to do the job. Now then, it boils down in the last analysis to this, that if this State-owned property is on privately owned land and if it is necessary to develop the privately owned land to get this superabundance of wildlife, where is the owner to receive his compensation or incentive to do the job.

FARMER-SPORTSMAN COOPERATIVES

By L. G. MACNAMARA, superintendent, wild game management, New Jersey State Fish and Game Commission

Due to the fact that the State of New Jersey contains within its boundaries a very heavy population, a very diversified type of agriculture, a heavy sportsman's populace, and a varied range of ecologi-

cal conditions, it is our belief that it is a very desirable proving ground for those problems affecting farmer cooperatives.

It is regarded that in order to be successful, any cooperative program must be deeply imbued with cooperation and understanding affecting the parties involved. This means that the New Jersey State Fish and Game Commission, the landowner, and the sportsman must be in a position to understand and appreciate the problems that confront each party, and also must understand the endeavors of the fish and game commission for the future of wildlife.

In the State of New Jersey the present sources of hunting lands to which the licensed hunter has free access are the farmer-sportsman cooperative land, land opened by sportsmen's clubs, State-owned public shooting grounds, and general open lands.

The farmer-sportsman cooperative plan is fostered and maintained by the New Jersey State Fish and Game Commission. It is the endeavor of the commission to creat a feeling of cooperation and understanding between the sportsman and landowner that will stand a test of time.

The following brief description applies to those lands that are entered as farmer-sportsman cooperative lands. One-fifth of the land owned by the farmer is a refuge, posted and maintained as a refuge by the New Jersey State Fish and Game Commission. This particular area, which is generally immediately adjacent to the farm buildings and pastures, is posted with the conventional red refuge sign. The penalty for trespass on this area is $50.

This refuge is designed to protect the farmer and his family, livestock, and buildings from random shots or possible accidents.

The remainder of the farm under this plan is open to hunting with the following restriction: The farmer, if he so desires, can limit the number of hunters on his land to one hunter per 20 acres. The sportsman must register with the farmer, thus giving the farmer an absolute check on the persons on his land. This particular part of the agreement is entirely up to the landowner.

The area is stocked by the New Jersey State Fish and Game Commission with due thought being given to the extent of area and food and cover. In addition, advice is furnished concerning game management and all its relative factors, and also stream improvement. Special cooperation has been given in the creation of food patches, the seed for which is furnished by the commission.

The progress of the farmer-sportsman cooperative plan with regard to the total huntable area acquired is interesting and displayed in the following table:

	Acres
1933	52,500
1934	102,633
1935	127,759

It is a plan that is acceptable to the farmer, because it controls hunting and fixes the responsibility of possible damage and depredations. It is a plan that is mainly designed to open that land which was formerly posted against trespass.

B34454

A. Mallards in the closed area of the Lost Island Refuge near Alma and Buffalo City, Wis. (Biological Survey photo.)

B42054

B. Nest of mallard eggs. (Biological Survey photo.)

B29600

A, Spruce partridge in Kuskokwim River area, Alaska. (Biological Survey photo.)

B43411

B, Placing feed in winter feeding box for game birds. (Biological Survey photo.)

LAND OPENED BY SPORTSMEN'S CLUBS

No picture of farmer cooperatives in the State of New Jersey would be complete unless mention was made of the land opened by the sportsmen's clubs. In a general organization of a sportsmen's club formed with the intention of opening desirable lands to hunting, the farmer is asked, and in most cases does become a member of the club. It is a plan that is founded on the spirit of cooperation, and with the intent to create a more understanding gunner. This is a mutual organization in which both the sportsman and the farmer take part. As a member of the sportsmen's club, the farmer is in a position to advise, present his views as he sees them, and take an active part in the affairs of the sportsmen's organization. By this method of organization, it is common for a sportsmen's club in New Jersey to open a hundred farms in their locality to hunting and fishing. New Jersey Fish and Game Commission fosters the movement by offering advice and assistance in all matters that would create better hunting and fishing on these areas. The commission likewise stocks the areas and enforces the laws as pertaining to game.

On an area thus formed, the number of hunters per farm is not controlled. The area is not only open to the particular sportsmen's club in that locality, but is open to all licensed hunters within the boundary of the State of New Jersey.

The feeding and care of game on these areas is carried on by both the sportsman and the farmer, and if any posting is to be done, the sportsman is responsible for such a duty. The areas immediately adjacent to the farmer's house and buildings are posted with red signs and the other signs that might be used are conventional white signs setting forth the sportsmen's code and entreating the gunner to abide by it.

This movement is spreading rather rapidly in certain sections of the State of New Jersey. It has had a very valuable reaction to wildlife because a deep interest shown by the sportsman has caused him to innovate a very definite and thorough winter-feeding program. New Jersey State Fish and Game Commission cooperates with them on this important duty and in most cases furnishes the feed to a large extent.

PUBLIC SHOOTING AND FISHING GROUNDS

While the New Jersey public shooting and fishing grounds do not come under the heading of farmer cooperative lands, they deserve recognition due to the fact that they offer a pattern to the farmer, and shows him how certain factors should be dealt with to increase and maintain an adequate supply of game. These areas are purchased by the New Jersey State Fish and Game Commission for the use of all licensed sportsmen.

In addition to the fact that farmer and sportsman alike can use these areas as patterns, the farmer is sometimes allowed to till cer-

tain designated portions of a public shooting ground under the supervision of the commission. When this is done, a certain specified crop is raised and a certain proportion is allowed to stand unharvested. In using this method, it is often advantageous, as it is an economical way of maintaining a food supply on these areas.

OPEN LANDS

Open lands consist of those acreages in the State on which the owner imposes no restriction. The lands are stocked by the commission, the number of hunters are not controlled, and as in the previous mentioned cases, advice is given to these owners concerning the proper management of covert and stream. These lands are not posted.

With the firm cooperation between the landowner and sportsman, the New Jersey State Fish and Game Commission expects to augment and increase the present game and wildlife supply. It offers a very acceptable method by which the main factors of conservation—namely production, protection, and education—can be increased in efficiency and extent.

DISCUSSION

Capt. H. J. Burlington. Speaking as commissioner, in New Jersey one-third of the license fee goes for the protection of public shooting grounds or any other ground controlled by the commission; therefore, we are able to supply feed and stocking on this farmer-sportsman project. One-fifth of the State already taken over by the project. These grounds were previously closed to the public. We always thought we had to pay the farmer but found 90 percent wanted protection. So we found that by contacting these men through our field agents 99 percent accept readily. The result has been 80 percent of the farmers have cooperated with the game commission. They have put out feed patches on their own hook sometimes. They get three times as much kill on such land as on open part of the State because we do not have enough money to stock open lands.

There are no hard-and-fast rules. Say 50 percent make records of the amount of game killed and turn records in to the commission at the end of the year. Thirty percent do not want to be bothered with sportsmen. They say, "Protect our lands and houses and we do not care what you do." Ten percent have not played the game. Soon as we find this out we drop them. Every year we drop 10 percent and add 20 percent which accounts for the increase from 53,000 to 80,000 and to 123,000 acres this year.

Mr. Adams (New York). How much money out of your license fee have you to play with that is in dollars?

Capt. Burlington. One-third, or about $100,000.

Mr. Adams. How do you use that?

Capt. Burlington. Purchase game—pheasants, rabbits, and so forth, and raise them, up to about 60 percent of that amount, the balance spent for game management and the purchase of public shooting grounds. Spent approximately 60 percent for game on public shooting grounds and farmer-sportsman.

Mr. ADAMS. Remaining, 40 percent?

Captain BURLINGTON. It goes to buy permanent shooting grounds and to pay for overhead already banked up, and for half dozen game conservators and game management men.

Mr. ADAMS. How do you supply protection?

Captain BURLINGTON. Fifty acres are posted every 200 feet with red signs and we passed a law that none but the landowner, farmer, or sportsman can enter that land. A $50 fine for others. Only one case of trespass, so we would say it was complete protection.

Mr. ADAMS. Do you practice any control other than regular wardens?

Captain BURLINGTON. We have 4,000 volunteer deputy wardens that help protect.

Mr. ADAMS. Any compensation?

Captain BURLINGTON. None. A man gets $5 for making an arrest

Mr. MCKILLEY (Texas). What is your educational method?

Captain BURLINGTON. We have 100 daily papers and 300 weekly and a release from our commission goes to all of them. Also have moving pictures of raising game and of game management such as feed patch results, et cetera. New Jersey is so small, the size of some of your counties, it is not so hard to educate.

Mr. MCKILLEY. Any education in schools, textbooks, etc.?

Captain BURLINGTON. Not yet, but planning on some.

Mr. REAGEN (Kentucky). What was your revenue?

Captain BURLINGTON. Our total revenue for licenses was $346,000.

Mr. REAGEN. Do you have field men who visit public schools, rotary clubs, chambers of commerce, and other organizations?

Captain BURLINGTON. To some extent.

Mr. REAGEN. To what extent do you attempt to educate landowners?

Captain BURLINGTON. General education. There are nine commissioners speaking in all parts of the State and we have movies.

Mr. BOONE (Iowa). What effort are you making in actual fencing for grazing?

Mr. MCNAMARA. There is some fencing.

Mr. ADAMS. Does State supply fence?

Mr. MCNAMARA. Yes.

Mr. ADAMS. Does State fix farmer's fence?

Mr. MCNAMARA. Yes; because of increase in game as result.

FARMER-SPORTSMAN SET-UPS IN THE NORTH CENTRAL REGION

(By Aldo Leopold, University of Wisconsin)

Since 1931 I know of at least 350 farmer-sportsman areas which have been tried in the North Central States. Perhaps 50 are officially sponsored as demonstrations or experiments; the rest are officially supervised shooting areas operating under preserve laws or special regulations. Most of the 350 survive, at least on paper. I will try to derive some conclusions from this experience.

There are six types of organization known to me, and three choices of legal status, hence 18 types of set-up are possible. If we add hybrids and shifts, the possible combinations are more numerous.

For brevity, I will discuss mainly such of the 18 types as I have tried, or seen tried, in our State, with incidental reference to others in nearby States. The 1935 distribution by types and States appears on the diagram.

1a, 2a. Commercial areas.—In these types the farmer simply leases his shooting to an individual or group. The farmer has no duties and no privileges. The shooter does the management or hires it done, or else he pays a fee to an intermediary operator who does the management and pays the lease. In Wisconsin the intermediary is usually a game farmer who operates a shooting preserve, consisting of leased farms, in conjunction with his game farm.

About 65 such areas have sprung up in Wisconsin, of which 59 survive. In Michigan these developments were cut off by the repeal of the law.

In my opinion these commercial set-ups have a place in upland game (as distinguished from waterfowl) management. There is room for more of them, but I cannot profess to any great personal enthusiasm over this fact. My enthusiasm is dampened, first, by the rigorous predator control which usually goes with them, and second, by the frequent difficulty of adjusting them to public equities.

Some have stocked vacant range, in which case the public has no just complaint. Others have settled upon wintering marshes which draw pheasants from the adjoining township despite shooting, in which case their public relations are dubious at best. Others have settled upon what looked like wintering marshes, but from which the pheasants disperse at the first smell of powder. In such marshes the costs per bird run high.

Some preserves feed all winter, respect protected species, and have really been a benefit to quail, chickens, Hungarians, and even deer. Others quit feeding as promptly as a duck club, and there have been some suspicious disappearances of rare species within their boundaries.

Preserves on marshes which draw birds can make money, but those on poorer marshes have to charge around $3 per bird to break even.

In general, I think the future of pheasant preserves in our State is dubious unless the State furnishes more rigorous inspection and more positive guidance. Lacking this, the careless minority will permit abuses, which will lead to a blow-up, as in Michigan.

3a. Cooperatives.—Most people assume that all preserves are either private clubs or commercial. They overlook the opportunity which a preserve law offers to a group of farmers and sportsmen to produce birds noncommercially for their own pleasure. We have only one such preserve in our State, the Riley Cooperative, of which I happen to be a member. Its operations have been described elsewhere. (1) Farm and town members share the shooting on equal terms, but the dues of the town member are cash, while those of the farm member are the use of his land and grain. The cash goes to buy signs and license, and to pay one of the farmers for rearing. We set about 200 eggs and get through with 100 birds, of which we are permitted to kill 75, but actually are able to kill 40. Our birds cost the town member fully as much as if he shot them on a commercial preserve, but the atmosphere is far different. Our group is so small that all relations are personal. Our "common stock", namely, the wild birds

on the area, is growing yearly. No valuable predators need die that we may shoot; we have never had to control anything but cats, and once in a while a Cooper hawk. We have the satisfaction of carrying, unshot, a stock of quail, and a few chicken and ruffed grouse. No member ever shoots more than a bird a day, or at most two.

It is theoretically possible for just such a cooperative to operate under the ordinary law (type 3b), but you will notice this space is blank on the diagram. Apparently the regular open seasons are simply too short to offer the requisite inducement. That is to say, this particular set-up is operative only on artificial pheasants. I think a slow and cautious extension of the shooting preserve principle to wild propagation of other species is in order, but apparently no State save Iowa has so far had the courage to try this.

5A, 6A, 5C. Iowa farmer pools.—Iowa has on its books the incredible total of 279 areas, 14 already with special seasons (5A, 6A), many of the rest trying to qualify for one (4B, 5C). I am out of touch, and not competent to interpret these figures. Bode (2) gave a good description of the Iowa system in 1934.

I have the impression, though, that the Iowa experience has disclosed some important warning signs. The Iowa Department not only pushed the organization of these many areas, but undertook a positive advisory function as game manager for each. Most of the field wardens proved unable to help much; hence an impossible load fell back on the shoulders of the overhead staff. The commission refused to expand that staff, which has now further suffered political disruption.

Perhaps this indicates that it is impracticable for a State to assume such positive functions for such a large number of areas. Perhaps a much slower and more selective growth, with much more responsibility carried by the local warden and the farmer, is faster in the long run. Perhaps more training of both farmers and wardens is needed. At any rate it is impossible to load 279 areas on two or three staff biologists. I myself find it impossible to run more than half a dozen, even with the help of my students.

I cannot here refrain from taking an anticipatory shot at any attitude of merely scoffing at the Iowa attempt. Whether Iowa succeeds or fails, it takes courage to attack this difficult problem of how to make the transition from the old system, which is bankrupt, to some new system, which is as yet only dimly defined.

2B. Private individual areas.—These present no particular complications, and are almost a certain success where the individual farm is large enough to hold the species in question. There are probably many more than the diagram indicates. The Elkhorn area, near Elkhorn, Wis., is unique in two respects: The owner supports a University Fellow (Douglas Wade) to operate the area, and the object of management is to restore the exterminated ruffed grouse and quail, not to shoot but to look at. Quail range has been built to order before, but not, I think, grouse range.

4B. *Farmer-sportsman associations.*—In my State we have tried three, two of which promptly failed due to quarrels between the farmers and the local village sportsmen. The other, which has had no official steering or nursing since the day it was organized, has been an astonishing success. It lies at Brillion, Wis. It is the essence of simplicity; any outsider who wants to hunt has to join the association.

The officers do the work. The management is mainly for cottontails, which I hear responded wonderfully to the simple device of alfalfa haycocks set on brush. I doubt if this would work in a larger town, or without one or two drivers to keep the wheels turning.

5B. *Farmer pools.*—Open for a fee, have failed in this State so far, doubtless for lack of local leaders. The now famous Plain Church area in Ohio is of this class, and has been described by Horace Lytle (3). The device of turning shooting revenues into some community enterprise, such as a church neatly solves the otherwise knotty problem of "whacking up" revenue.

6B. Farmer pools, open for a ticket, include the well-known Williamston (Mich.) area described by Wight (4) and also the northwest Kent area, described by English. (5) I have no new comments.

6C. *Farmer pools not yet opened.*—This is of course merely the preliminary stage of 6B. It includes the Faville Grove area at Lake Mills, Wis., which is unique in several respects:

(1) Its objective includes the restoration of prairie and marsh flora, as well as game.

(2) A deliberate effort in "nature education" is to accompany the game-management program. This is to include the village as well as the farm schools.

(3) This is the first Wisconsin area to be operated by a graduate student in game management (Arthur S. Hawkins).

(4) The whole project is built around the outstanding personality of a veteran farmer-conservationist, Stoughton Faville, of Faville Grove Farm.

In such a community any effort to rest the game-management program on a revenue basis is not only unnecessary, but would be obnoxious. So far the Hungarians, pheasants, and quail have not reached shootable population levels, but when they do, it is clear that the farmers will want to do their own shooting, and any outsiders will be on a guest, not a customer, basis.

The management plan includes the reintroduction of the exterminated ruffed grouse and the building up of a prairie-chicken remnant. There is no prospect of ever shooting either species.

The present viewpoint on farmer cooperatives is vastly different from that of 1931.

It was then hoped to evolve a standard set-up which would spread all over a State in a decade. In fact, the Nebraska plan (6) proposed to dispense even with the decade; it short-cut all such pottering nonsense and forthwith established a State-wide coupon system by one magic stroke of the administrative pen. We are now more modest. If the present generation, within its lifetime, can get this job fairly started, we may be proud of our record.

The search in 1931 was for a standard mechanism, a mimeographed constitution and bylaws which could be stuck into the mailing machine, and presto—every "no-hunting" sign would read "shooting to let", with a covey of birds scratching dust at the post. I still get a letter a week asking for a copy of "the best" way to organize farmers. I no longer worry much about mechanisms—they will come when the farmer is as proud of his prairie chickens as he is of his silo. It may well be said that the search today is for "the best" way to change the land philosophy of America.

The objective in 1931 was to contrive something to shoot and permission to shoot it. Cash revenue was an important ingredient of "the bait." I no longer believe that a farmer is going to bother with performing his own game management unless he enjoys game, and if he enjoys game, the chances are he also enjoys, or can be taught to enjoy, the profile of an old bur oak, the wheel of a screaming redtail, the purple of winter willows, the gleam of a ladyslipper in the marsh. To such a farmer game revenue is not a profit, but merely a way to help offset costs.

On the other hand, the indifferent farmer is more than willing to pocket his lease money if somebody else does the work, but such absentee work is poor at best.

These conclusions are accurately corroborated by the experience of Germany and Czechoslovakia. The farmer who does his own game work does it well and does it for love, not profit. He also does his own shooting, and outsiders are guests, not customers. The farmer who leases out his shooting leaves the work to the lessee, and cooperates passively or not at all. Such leased shootings are at the mercy of adverse economic trends like slick-and-clean farming and slick-and-clean forestry. The German sporting press is full of laments over the farmer who sells you the shooting and then chops out the fence row and mows the slough. To raise game on such land you resort to overartificial propagation, which in turn kicks back at the health of the game and the very existence of the predators. It is a vicious circle; and I hope we stay out of it wherever we can.

In short, we thought, in 1931, that we were dealing with a detached problem in the mechanics of game production and use. We find, in 1936, that our problem also involves many other land uses and also many motives, tastes, and attitudes, and that it cannot be detached from the larger and slower question of establishing the role of conservation in American farm life.

In 1931 we aimed to feed out technical advice to university-sponsored farm areas by occasional visits. In Wisconsin we have found this to be not only insufficient, but wasteful of opportunity. Each professional game student is now required to live on and operate his own area for at least a year. This is an apprenticeship, the successful completion of which is a prerequisite to further research work. I will not belabor the obvious advantages of this plan. One perhaps unexpected advantage is that the farmers like it. Its disadvantage is the temptation to do the farmer's game work for him. We try to avoid this, except as it is necessary for the conduct of research experiments.

The big question in any and all officially sponsored farm game areas is how long they will last after the official stimulus is withdrawn. I simply do not know. I feel very strongly that in agricultural colleges there ought to be a direct connection between game-demonstration areas and farmer short courses, but I as yet lack a way to make this connection. That is to say, I have yet to find a way to use the short course as a training school for young leaders of farmer conservation groups. Short courses are indoor affairs, but you cannot teach much game management to farm boys indoors. We try to offset this by field trips to nearby demonstration areas, but when you start to teach game you immediately get a large en-

rollment. Large classes are hard to transport and hard to teach, and their duration is too short to weed them down to small ones. Written quizzes are patently a worthless way to weed for genuine interest in game. Perhaps the way out is to make membership in and election by a farm group a prerequisite to the short-course game work.

In conclusion, let me express a—to me—new thought about why we find ourselves organizing farm-game demonstrations, and why we find ourselves ascribing more importance to half a dozen microscopic specks on the State map than we do to our more comprehensive strokes of propaganda which sweep in graceful arcs from Lake Michigan to the Mississippi, or from the Sierras to the coast. It is the difference between vertical and horizontal planning.

When we build a bureau or a department to promote game, or forestry, or parks, or erosion-control, we are trying to spread an idea over an infinite horizontal expanse. We soon learn that such an expanse is bumpy with variations. Some spots are absorptive, others are slick and hard as glass. Our idea flows out very thin or will not spread at all. The poor administrator with the paint brush is distraught. His difficulties tax the endurance and reach of his mental arm.

Now when we try to spread two partially complementary and partially opposing ideas over the same expanse, the two administrators with their paint brushes are soon at their wits' ends. He who wields the shellac finds that the spot he is working on is already full of varnish, or vice versa. The two agree on a division of ground, but these divisions blur at the edges or scale where superimposed. Both then run to Congress for more paint. Congress grants not only more paint but a whole platoon of more painters, together with sermons on bureaucracy and blue prints for reorganization of departments. The party isn't over yet, so I can't tell you how it finally ends.

Now this all comes from trying to cover too big a surface all at once. If we could focus the minds of a whole battery of conservation experts simultaneously on one spot, they would, I think, often reach an agreement on its condition, its properties, and its needs. They would know how to prepare it, and how much of what to put on it. Result: An intelligent, effective, and relatively durable job of painting. It may take a long time to cover the country spot by spot, but that is preferable to a smear. The farmer-cooperative is spot no. 1. It is the beginning of vertical planning for the application of conservation ideas.

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Farmer-sportsman set-ups for upland game management, Wisconsin and nearby States, 1935

Organization	Legal status of area		
	A. Preserve law or special season	B. Ordinary law	C. Refuge (or not yet opened)
1. Commercial, fee	Wisconsin 30 (?)		
2. Club or private	do	Wisconsin 1 Indiana 1	
3. Farmer-sportsman cooperative	Wisconsin 1		
4. Farmer-sportsman association		Wisconsin 1 Iowa 100 (?)	
5. Farmer pool, fee	Iowa 7 (?)	Ohio 1 (?)	Iowa 100 (?).
6. Farmer pool, ticket	do	Michigan 2 Indiana 1 (?)	Wisconsin 1.

(Mr. Leopold delivered his paper with the aid of a chart showing 18 kinds of farmer-sportsman cooperative set-ups.)

DISCUSSION

Mr. Beyer (Wisconsin). Referring to Professor Leopold's paper regarding the pheasant population not up to shootable proportions. It can be built up by helping nature. They can breed faster in captivity rather than in the open. Should be raised as chickens. If the limit was 2 chickens a year we would not have the 5 million chickens today; 3,000 game breeders in the country are interested in this question.

Mr. Seymour. Have you a posting system?

Mr. Leopold. All lands posted.

Mr. Seymour. On private farms where it is posted, do they respect that posting?

Mr. Leopold. Some places, others not at all; however, areas posted are better respected than those just marked "No trespassing." The posting tells an intruder "here is a piece of land on which the owner is doing something for the benefit of the enclosure."

Mr. Seymour. Wouldn't it be better if you had a State law making it illegal for anyone to go on the farmers' land without permit?

Mr. Leopold. We have such an owners' permission law.

Mr. Beyer, I agree with you, but we do not want many pheasants on Lake Mills.

Mr. Eaton (New Mexico). Give eligibility of membership in various organizations. May anyone join or are they limited?

Mr. Leopold. Farmers are eligible as individuals and as groups of farmers where every member is willing. The community must pull together. Examine the chart, which will explain better than I can.

Mr. Cook (Wisconsin). Our problem is the 1-day hunters. They do not care to join the sportsman organizations, as they go out only on opening day or weekends. One-day hunting can be got on farms. We had to have lands where the 1-day hunter can go. His Congressmen have been behind him. He goes out to hunt and sees lands posted and is sore because he says the hunting lands are for rich men who can afford to belong to these organizations.

Mr. Le Compte (Maryland). Referring to open season, how long is it?

Mr. LEOPOLD. Five days under State law, 3½ months shooting-preserve law. On the Riley preserve there is no shooting during that 3½ months. Cannot shoot when snow comes on, as birds leave then.

DEVELOPMENT OF FARMER-SPORTSMAN COOPERATIVES IN NEBRASKA

(By FRANK B. O'CONNELL, secretary, Nebraska Game, Forestation, and Parks Commission)

The farmer has a very definite part in the propagation and restoration of game birds.

Many of us, especially in the West, where we have had the public domain and thousands of acres of sparsely settled agricultural and grazing regions, have been slow to commit ourselves to any form of hunting that smacks of commercialism. But times are changing; more hunters than we dreamed of are taking to the field; the game bird, with a few notable exceptions, is steadily and inerably decreasing.

Nebraska sportsmen realized 6 years ago that some sort of farmer-sportsman cooperative should be established. At that time we had enacted into law what we called "The Hunters Shooting Script Act." This law, while reserving to the State the title to all game birds, set up the machinery by which the farmer could have a part in game-bird propagation. He permitted his farm to be known as a Script Farm, fed the birds on his premises, attempted to increase their number, then allowed a limited number of hunters, holding shooters script issued by the State, to hunt on his land. The State, in turn, had sold books containing coupons to the hunters, the value of the coupon fixed by the State game commission, but in no case more than 50 cents per bird.

Unfortunately, we put the plan in operation at the wrong time. Farmers at that time were not as anxious to increase their revenue. The State failed to give them sufficient encouragement or to furnish adequate breeding stock. The result was that we sold many coupons, but few farmers would put their farms under the plan or bother to collect the revenue.

We hope to put the plan into effect this coming year on a more businesslike and extensive basis. We are seeking the aid of the farm press, our college of agriculture, and other agencies to sell the idea to the farmer. We hope that further information and suggestions will come out of this conference. We hope to be able to aid the farmer in the production of the game, as we feel this is the part the State must play.

In Nebraska we have never attempted to establish a game farm where birds were to be raised in large numbers. We have never done this because we could not see where we could raise the birds we wanted in large enough numbers at an overhead cost per bird to make it worthwhile. When you operate on funds of only a dollar per sportsman-capita, you can't put out very many two and three dollar game birds.

In the past we have attempted to increase our hunting by extending the hunting territory. The pheasant was used mainly for this. We trapped over 50,000 of the adult birds where the bird population was heavy and stocked counties where there were few or no birds.

While that was somewhat of a "Rob-Peter-to-pay-Paul" plan, it worked quite successfully and enabled us to eventually open most of the State to pheasant hunting. However, the pheasant has now become so popular in Nebraska, and the drought, heavy hunting, and other causes have so reduced the number of birds, we are now unable to find any concentration of birds where we would be justified in trapping them.

We are rapidly coming to realize that the farmer must be interested if we are to raise game birds in sufficient numbers to satisfy the thousands of gunners. We do not believe that State game farms, even where ample funds are available, can keep up with the demand. Therefore, we are planning to solve the upland game bird problem along this line.

1. Establish an experimental game-bird cultural farm where practical and inexpensive methods of producing birds is worked out. This should be done somewhat similar to the way a State agricultural college operates—not to raise the birds but show the farmers how to raise them. Nebraska already has such a farm in the making in one of our larger sanctuaries. Control preditors cover.

2. Secondly, a simple plan, controlled by law or regulation, wherein the farmer can raise birds and receive some remuneration for his work. Nebraska now has such a plan enacted into law.

3. The allotment of funds to furnish the initial breeding stock for farms that operate as a Farmer-Sportsman Cooperative Farm. This money should come either from the State or organized sportsmen.

We feel in Nebraska that the cooperation of the farmer is most essential in the restoration of the upland game birds. The migratory waterfowl problem is altogether different, and while the farmer and rancher has a part in the restoration of those birds, he is not as necessary as in the propagation of the bob-white, pheasant, grouse, and partridge. We have used every possible means at our command to build up a friendly relation between the sportsman and the farmer. One of the best means to do this, we have found, is a winter-feeding campaign. Many farmers have always felt that the only time the sportsman is interested in the game bird is during the open season; that he must feed the birds the other 11 months of the year. But, when during the winter months, a conservation officer comes into a farm community and says, "Mr. Farmer, I have a truckload of grain out here that has been sent up by the sportsmen of Omaha. Will you and your neighbors put some of it out for the pheasants?" Well, 9 out of 10 farmers, who after all are human and usually pretty good sportsmen themselves, will have a much friendlier feeling toward the sportsman when the next open season rolls around.

No one wants to see the European hunting system put into force in this country. Hunting is one of the great character and body builders of our manhood. We must not allow it to be taken away from the rank and file of our youth. Neither must we allow it to be commercialized to the extent where only a few can indulge in the sport. With the potential possibilities we have in the way of thousands of square miles of territory, millions of farms, numerous agricultural colleges, thousands of forward-looking sportsmen, I can see

no reason why American initiative cannot solve the game-bird problem and restore to American gunners one of the finest sports that can be found.

DISCUSSION

In Nebraska we do not deal with individual farmers but get a group together such as a township because one farmer aids the others in getting away from the practice of having friends come in to shoot as they can say they have joined the association and are not allowed to permit shooting.

The Development of Farmer-Sportsman Cooperatives in North Carolina

By John D. Chalk, commissioner, Game and Inland Fisheries, Raleigh, N. C.

The subject the program committee has assigned to me for this paper is Development of Farmer-Sportsman Cooperatives in North Carolina, and in dealing with this subject I regret that I will be unable to point out to you any specific cases of model organizations in our State for the reason that the movement is just in its formative stage and the accomplishments in this line of work heretofore in our State have been through the cooperation between individual sportsmen and the landowner, or between the landowner and organized hunting clubs composed of small groups of sportsmen, but I am glad to report that through these mediums, a great deal has been accomplished in North Carolina during the past 10 years.

North Carolina is fortunate in always having had a bountiful supply of game birds and game animals. I do not mean that our people during the last decade have enjoyed field sports comparable with our forefathers, but we have had and still have a goodly supply in comparison with a great many other States in the Union. Our population of slightly over 3,000,000 people is spread over an area of 53,000 square miles, and we have no densely populated areas. The climate is mild and the cover and natural food supply is more favorable than in most sections of the United States. These local facts have largely been responsible for the slowness of our people in realizing the need of organizations to improve the working arrangements between the farmer and the sportsman, but the idea is rapidly gaining favor through the educational efforts of the various farm and civic organizations in the State and through the efforts of the department of conservation and development and its field forces. The department is now getting out a booklet, entitled "Game as a Crop." This booklet will be distributed among the farmers, hunters, and sportsmen of the State and will point out to the farmer the importance of maintaining the proper field cover and foods for game birds and game animals and various other features that will enable him to cater to the sportsman who is in the market for good shooting and is willing to pay a reasonable price, thereby furnishing an additional much needed income to the landowner. It will also show the sportsman what he may do as his part of the program. The educational items presented in this booklet will not be entirely original with the North Carolina department; in fact, the material consists largely of assembled biological facts, most of which have already

been circulated by State and Government departments. The North Carolina department is also preparing a conservation textbook for use in the public schools beginning with the fall term of 1936 and realizing that in the younger generation lies our greatest hope in the field of wildlife conservation training, we shall in this text-book make an attempt to train the young mind to the need of close cooperation between the farmer and the sportsman.

My observation is that people of the United States are traveling rapidly toward a full appreciation of the value of our wildlife as a natural resource. At least we are reaching that viewpoint in North Carolina, and to prove this claim as it applies to North Carolina, let me call your attention to the progress recently made in a legislative way in our State. Previous to the last legislature, which was in 1935, our game laws and fish regulations were ununiform, unapplicable, and unsuited in a great many ways to the needs of fish and game in our State. The regulations were an accumulation of laws and rules made from time to time and for various reasons, some of which may have been largely political as is so often claimed by some of our people, but the last session of the legislature junked the entire outfit and gave North Carolina the kind of legislation it has always needed and that I believe most every other State needs for the proper handling of their wildlife and fish programs. The 1935 legislature vested in the department the authority to "fix seasons and bag limits" and to otherwise administer the wildlife program of the State in a manner suitable to the needs of the State as they exist from time to time. That legislature was the most conservation-minded body of lawmakers in the history of North Carolina, and why were they so? They realized and their constituents back home realized that the wildlife population of North Carolina is one of the State's most valuable resources, and that the wildlife program must be scientifically and effectively administered in order to keep abreast of the needs of the State in that direction. They realized that the game-management work and the fish-culture program of the State was and is a specialized line, the administration of which could not be effectively handled by a legislative body meeting biennially, so they passed the necessary laws giving to the department the authority enabling it to function fully and properly. Now the question in your mind is, How are these new regulations working out? I am happy to report to you that in this first year of operations they are nearly 100-percent perfect. Our people realize that the new regulations are fundamentally correct, and we have had but few requests for changes and these requests were for minor local adjustments.

I mention these facts to show the change in the attitude of the people in North Carolina toward the administration of the wildlife resources of the State. They realize the importance of proper handling of these resources. This increasing interest has been brought about largely by the realization of the decrease in the wildlife supply and by the educational work of the various organizations, both State and national, all of which are doing excellent work and are helping to improve the relationship between the farmer and the sportsman.

The farmer has always been and will continue to be the custodian of the greater part of the wildlife population and he needs all the

scientific information he can get to assist him in carrying out the wildlife program on his lands. I have made a close study of the farmer's attitude and his interest in his wildlife problem, and I find in most cases he is ready and willing to do his part toward propagation when he sees the opportunity to improve conditions on his lands for himself and his friends and the sportsmen to whom he may cater. He may not always be strictly interested in this work for gain, but it is my belief that he is beginning to see the problem from that angle.

In North Carolina during the past 5 years we have had an increase in the quail population, the quail being the choice of our upland game birds. Our deer and bear populations have also shown an increase. These increases are due to several causes, namely, improved protection, service, increased refuge areas and improved refuge protection, and, last but not least, improved cooperation between the farmer and the sportsman in helping provide better protection and improved environment for game birds and game animals.

Cooperative Game Management Plans in Iowa

(By Logan J. Bennett, U. S. Bureau of Biological Survey [1])

In Iowa 95 percent of the land is devoted to agriculture. The remaining 5 percent consists of lakes, marshes, flood lands, and other so-called waste areas. With such a high percentage of the acreage used for agriculture it is probably of greater importance to Iowa than to any other State to work out a game management program that is practical and economically sound from both the standpoint of the farmer and the sportsman.

There is one plan that has worked out very successfully. The conservation commission has under its control several dry or drained lakes. Sporting organizations have leased two of these lakes from the State for $1 a year. The free use of a game technician was furnished by the conservation commission to draw up the management plans for these areas. The management practices were put into effect by the sportsman's organization. The increase in the number of pheasants was several hundred percent the first year. It is the plan of the conservation commission to develop all of their dry or drained marsh and lake areas in this same manner through the aid of local conservation or sportsmen's organizations. However, as these areas are within the 5 percent of the noncultivated lands, a much broader game management plan has to be worked out for the State as a whole.

During the past 3 years about 130 game management areas were set up in Iowa. Most of these are quail areas. The areas range from 640 acres to 17,000 acres in size. These areas were posted with signs that read "No hunting without written permission." When the areas were set up originally the farmer was supposed to carry out game-management practices such as planting cover in gullies and other waste areas. The value of trespass control was used as the original incentive to gain attention to the bettering of game conditions. In many cases the farmer forgot all about the game, once the

[1] Iowa State College and the Iowa Conservation Commission cooperating with the U. S. Bureau of Biological Survey.

no-trespass signs were up. This was probably to be expected, but it can hardly be set down as a failure because the size to which the program expanded in so short a time resulted in an intense lack of personnel to give the farmers the follow-up and guidance needed in any program of this size. However, when the farmer was a hunter or was really interested in wildlife he did make an effort to practice game management. Perhaps the most valuable phase of this program was the pointing out to the public the causes of game-bird shortages and the importance and value of amicable working relations between hunter and farmer. In these respects the program thus far has been worth every cent spent on it. Sixteen years prior to 1932 the season was closed on bobwhite quail. It has been made very clear to the farmers, sportsmen, and general public through the game management program that the destruction of cover was probably the cause of the bobwhite's decline. Today in Iowa the public is aware that quail shooting is possible through proper game management, and that management is an essential to withstand the continued pressure on both quail and pheasants. Iowa has had an open quail season on these management areas for the past 3 years. The cost has been high for the conservation commission, and the hunting has been overly restricted.

That this would be the case in getting any quail shooting started in Iowa was clear to the commission from the start, because the reopening of quail shooting in Iowa was brought about through cooperation of those groups who had insisted upon its complete protection rather than by waging a battle against them. In order to safeguard their interest and not break faith with them and in order to know what shooting would mean to quail populations, it was necessary in the start to institute rather cumbersome methods and to make unusual expenditures.

With 3 years of trial at a thing for which there was no precedent to guide us, many weak points have come to light and a number of good ones. They may be summarized as follows:

1. Why should the farmer spend money and put forth much work in order to allow hunters to shoot on his land?

2. Many farmers went into the plan in order to keep out all hunters.

3. One year the farmers in an area may be in sympathy with the plan and the next year half of them move to other farms outside of the area. The incoming farmers may or may not be interested in increasing the game crop.

4. The areas were required to be at least 640 acres in size. This made it difficult for the small land owner who was interested in game to participate in the plan.

5. Many times on Saturdays and Sundays when the farmers were away from home hunters would drive all day and fail to find a farm to hunt on.

6. A written permit was required from the farmer. The birds had to be tagged by the farmer after the hunt. If it was a small farm or if only a few birds could be found, the hunter had to locate another farm, get another permit, and then have the farmer check and tag the birds shot on his farm after the hunt. This procedure irked both the farmer and the sportsman.

7. The restrictions and lack of management practices made the plan very unusable and expensive.

After having had 3 years' experience with this game-management plan, the Iowa Conservation Commission last fall undertook to eliminate as many weak points in the plan as possible. This was done in order to lower the administrative costs, to make the plan usable by the hunter, and to make the plan satisfactory for the farmer who had a real interest in wildlife.

The revised plan is outlined in brief below:

1. The size of the farm or area is not restricted to any size. If a man has an 80-acre farm and desires to practice game management he is eligible.

2. The farmer who wants an area must agree to carry out game-management practices as recommended by the game supervisor before the area is posted. After a reasonable length of time the supervisor checks the farm to see if the improvements have been made. If the recommendations have been carried out, the farm is established as a game-management area for 1 year.

3. The farm is posted with signs that read "Hunting with written permission, Iowa Conservation Commission." These signs are cardboard and last about 1 year. If, at the end of the year, the farm changes hands, or the farmer fails to continue practices favorable to game, the old signs soon disappear and are not replaced.

4. The farmer agrees to allow sportsmenlike hunters to hunt the surplus game.

5. The farmer is allowed to charge a reasonable sum of money for shooting rights.

6. The conservation commission aids in all possible ways to obtain shrubbery and trees for game-cover plantings that may be of value as soil-erosion control.

7. A sportsman in town may have a farmer friend who runs a small farm. In many cases these two people get together and qualify the farm for a management area. This leads to a clearer understanding between the farmer and sportsman and increases the game crop. (This sort of arrangement gave many individual hunters places to shoot quail in Iowa last fall.)

8. Many more farmers that are interested in doing something for wildlife are contacted by this method of accepting individual farms.

9. Written permission from the landholder is required but no tags are used on bagged birds or other game.

This revised management plan will probably not yield as great an acreage of controlled shooting, but the number of satisfied farmers and sportsmen will be greater in proportion to the acreage under management than under the initial plan.

Although even the present plan is far from perfect, it is a step toward the desired goal. The plan will have to be put on a sound economic basis before even a small percentage of the farmers will carry out game-management practices. The farmer produces corn, hogs, wheat, and other products for a profit. When the farmer can be shown how and why to produce game, many of our game problems will be solved.

B24468

A, Male willow ptarmigan in Alaska uses the top of a spruce as a lookout station. (Biological Survey photo.)

B20M

B, Five ptarmigans in winter plumage near Brush Creek, Gunnison County, Colo. (Biological Survey photo.)

255236

A, A black bear in the Fremont National Forest, Oreg. (Forest Service photo.)

177734

B, A chipmunk in the Medicine Bow National Forest, Wyo., lured to the camera by bread. (Forest Service photo.)

With the thought in mind of trying to find the answer to some of these problems the Iowa Conservation Commission, Iowa State College, and the United States Bureau of Biological Survey have four experimental areas in Iowa to determine if and how the farmer can devote part of his time to the best interests of wildlife.

DISCUSSION

Mr. SEYMOUR. I want to say something about posting. A friend of mine was trespassed upon and he had the people arrested, and when brought up in court the man said there were no signs up, and the court on investigation found signs were taken down the night before. This posting law is a fine thing. You state you post with consent of owner. If you did away with posting and made State law that no hunter could go on land at all without permit, we would need no game warden. If you found a man with a gun on the property you would know he was hunting.

Mr. REED (Pennsylvania). Two principal things with regard to this farm hunting proposition. We must evolve some system to take care of 1-day hunters, and, secondly, with regard to the statement that after considerable experiment it was found the one thing the average farmer wants is protection. In Pennsylvania we are experimenting with it. We have evolved a system which is working and which answers both problems. First by organizing the sportsmen. In my county of Washington we have 2,800 members in our sportsmen organizations and we have 9,000 licensed hunters. In other words, in our organizations paid members represent approximately one-third of hunters in our county. We have assumed the protection of our farmers. I have here something that takes the place of a "no trespass" sign.

NOTICE TO SPORTSMEN

OBEY THE LAW—BE A CLEAN SPORT

Never take more than you can use—leave some for seed.
When fishing, wet the hand before returning the little fellows.
Please have respect for the landowner, also his fences.
Don't shoot near buildings and always close gates.
Report game-law violations to your game protector.
District game protector: Carl S. Stainbrook, 52 Harrison Ave.; Phone 566–J. Washington, Pa.
Join your local sportsmen's club and help promote better hunting and fishing, and develop better sportsmen; wear your button, and be a gentleman while in the field.

REWARD

A reward of $10 is hereby offered for information leading to the arrest and conviction of anyone damaging property of the owner of this land.

WASHINGTON COUNTY SPORTSMEN'S AND CONSERVATION LEAGUE.
COLIN MCF. REED, *President.*
A. LLOYD ROSSELL, *Secretary.*

That has answered in our district the two principal troubles we have. We admit we have a lot of irresponsible hunters but the others take responsibility for them to the farmer. Then we try to

get them in our organization and educate them to be the right kind of sportsmen. This is based on the idea that you have a sportsmen's organization because you cannot operate unless they are organized. But if organized and if you, the organized sportsmen, will assume the responsibility to the farmer that is all they ask. They do not want money but want protection. We say we will protect your land and post it and will come to the house and ask permission to hunt.

Mr. REAGEN (Kentucky). We have a trespass law. A license does not give you permission to hunt on any man's land without a written permission and if hunting without it you can be taken into court and fined. However, it is violated. The question is just how far we can go with these things. We find that through our system of education results have been beneficial. We have very little trouble with the farmer. There is some misunderstanding because the farmer thinks the conservation official must enforce the law but in Kentucky they have no authority regarding fish and game.

Mr. DAVIS (Georgia). In organizing the farmer-sportsman cooperatives our first step is to organize the sportsmen and if their organization is financed properly the farmers will cooperate. Will the gentleman from Pennsylvania tell how his State gets them organized?

Mr. REED. I will tell you how we organize. A few of us got together and we organized the sportsmen in Washington County. We went to the county treasurer and promised him $50 for a typewritten list of hunters licensed in the county, separated by districts. He took our promise of $50 and got the list. We divided it into the various districts, and we organized the clubs with 50-cent memberships. Keep the fees low that is the way you will get the rough-neck hunter and that is the kind you want to educate. They are the kind who damage fences, and so forth. We had 20 men at the first meeting and in 6 weeks we had 500 members. We gave them prospects—a typewritten list. They had something to work on, and they went at it. To keep them you have to entertain them, so we provide movies, speakers, and so forth. The State Sportsman's Federation meets once a year in Harrisburg and handles State affairs of sportsmen. We sit down with the president of the Grange and talk things over in a friendly sort of way, but the rough-neck hunter and the farmer who will not cooperate have the trouble.

Mr. SKIFF (New York). What a great many State officials have to say about these cooperatives is considered unimportant by sportsmen who have their own ideas of what a successful cooperative should be. Therefore, it is particularly illuminating to me to note Professor Leopold's 18-point combination. I think in them he has listed every type that has come to us in New York. When they come to us with their troubles we are in a tough spot. After considerable study on these problems no one system can be set up which will meet the situation. Leopold's chart shows it is impossible. Is it not true that all the States can do is to provide enough leeway so there will be a legal provision for all these types?

(Leopold agrees.)

Mr. UNGERS (New York) [asks of Leopold]. How many members in your Riley project?

Mr. LEOPOLD. Seven farmers and five sportsmen.

Mr. UNGERS (asks of Reeves). On your sign you offer a reward for information leading to an arrest. Do you resort to strenuous methods?

Mr. REEVES. We have never paid $10 and the signs have been up 2 years.

Mr. MCFARLIN (Wisconsin). The reason our sportsmen have respect for the preserve is on account of the sign which is made of heavy material in the State prison. On it is "Wisconsin shooting preserve" and reference to the law and number. The name of the State on the sign gives it prestige and it is more respected than just a "no trespass" sign.

Mr. O'CONNELL (Nebraska). We have better success with groups in Nebraska because we can furnish better protection. We have found very little trouble with our sportsmen and farmers except this one thing and that is how to get more game birds on these farms and who is going to pay for them. Farmer is not being paid for wildlife but his fee is an assessment for the privilege of hunting on his land.

Mr. ADAMS. Does State regard these lands as kind it will restock?

Mr. O'CONNELL. Yes.

Mr. ADAMS. Why are you not being criticized that you are visiting on the sportsman a plan that will eventually cause them to pay for their sport?

Mr. O'CONNELL. We have had no trouble.

Mr. HOBSON (Pennsylvania). We have a wonderful organization in Pennsylvania. If we want more game we do not want to ask the farmer to supply it. We should supply it ourselves. We own today 500,000 acres of ground all paid for by the hunters. We are going to buy fishing lands shortly. Our land-purchase program is not complete. Our activities have been confined to land in mountainous sections. We are now coming to small farms. I believe you can buy farmland in the United States today for a song. I think the solution is through organization. I believe it is the only way to accomplish anything.

Mr. LECOMPTE (Maryland). As a game commissioner I want to call your attention to one fact. If you continue to restrict the number on the land what will happen to the license fees? The departments are supported entirely on fees collected from the hunter. If you are going to reduce your contribution from the hunters you are going to increase the number of hunters. In Maryland we have tried to educate the hunter to respect the farm owners' rights. We have tried to educate the farm owner that the hunter has rights. Not one farmer out of a hundred would refuse the use of his farm if hunters acted like gentlemen and asked permission. The more of these restricted areas you create the less revenue you are bringing into the department.

Mr. SCHOAG (Iowa). We found farmers are agreeable fellows. They allow sportsmen on their farms to hunt if their farms will produce game. We say we will give them protection if they will manage for more quail. They must feed them in the winter and do other things required of them under a game-management program. That is all well and good but they want to know what they get

out of it. We can raise game if we can find the place and make the arrangements so the hunter can come on the farm and get it. You are going to have to reduce expensive supervision. It cost $6 in one year on a $1 license fee. We must have a future plan that will get birds without a lot of expense on the part of the farmer and our department. Some incentive that will make the farmer want to build up game year after year. If we can do it we will have all these farms which is the ideal set-up. We must increase the carrying capacity of land for game. C. C. C. boys are making improvements for soil-conservation work with our department under our supervision for game management work.

Mr. Adams was called away so Mr. LeCompte took the chair and adjourned the meeting.

FISH MANAGEMENT

MONDAY MORNING, FEBRUARY 3, 1936

Chairman: NEWELL B. COOK, State Fish and Game Commission, Salt Lake City, Utah.

Committee: T. H. LANGLOIS, Chief, Bureau Fish Propagation, Columbus, Ohio; DR. EMMALINE MOORE, New York Conservation Department, Albany, N. Y.; GLENN C. LEACH, United States Bureau of Fisheries, Washington, D. C.

NEWELL B. COOK. I have been asked to preside at this fish-management branch of the conference, but because of a group of meetings to which I, and some others, think I should be in attendance—one meeting especially being a game conference (western)—with the consent of those present, I will ask Dr. Emmaline Moore to preside at this session to relieve me of this responsibility. I shall come back at my earliest convenience and be a member of this body. If there is no objection Dr. Moore will preside at this meeting.

USING MUNICIPAL RESERVOIRS TO PROVIDE MORE FISHING

(By A. D. ALDRICH, Superintendent Municipal Fish Hatcheries, Tulsa, Okla.)

The fact that commerce and industry have polluted most of our larger streams to such an extent that the waters are unfit for human consumption is past history. The cost of treatment and filtration has forced many cities to abandon their pumping plants and construct reservoirs where suitable water might be impounded.

Thus it was that the city of Tulsa abandoned its municipal waterworks on the banks of the Arkansas River and built a 2,000-acre reservoir in the Spavinaw Hills, 60 miles northeast of the city. Many of you are familiar with this system and its operation. The water is gravitated to Tulsa through a 60-inch conduit into the treatment and filtration plant located on the outskirts of the city, where two auxiliary reservoirs of 310 acres area have been built, which are kept overflowing by the surplus water from the conduit. This overflow supplies the 7 miles of lagoons winding through Tulsa's 2,600-acre Mohawk Park, and into Recreation Lake with an area of 70 acres.

Tulsans are justly proud of this great system which affords its citizens 2,500 acres of pure mountain water and practically unlimited recreational features, otherwise out of reach of the average citizen.

Many of you are also familiar with the western spirit of initiative and enterprise which has built up great industries and cities where only a few years ago the Red Man hunted the bison and the antelope. Most of us still have this inherent instinct which urges us to seek seclusion in the out-of-doors where communion with nature cleanses us of irritating concerns and duties. This same spirit is

manifest in every American in all parts of our Nation. It is and always will be a part of our natural selves and must have expression in form of outdoor recreation. Thirteen million Americans cannot all be wrong.

These facts are mentioned merely to lead up to the subject of municipal reservoirs and their use by the public for recreational purposes. The city administration in Tulsa, as well as many other cities in Oklahoma, have attempted to develop every possible facility on municipally owned and controlled property, which will promote the general welfare of the citizens, and their spiritual and physical well-being.

The public has so wholeheartedly endorsed and supported this service that it has become a permanent fixture. Our present water commissioner, W. F. Graham, under whose department this work is carried on instructed me to inform this conference, "that the city considers its municipal fish hatchery a sound economic industry and an adjunct of local government." One hundred fifty thousand Tulsans cannot all be wrong.

When we consider the figures compiled by various committees on the value of wildlife resources and the amount of money spent annually by those who use them we may arrive at a fair estimate of the total amount spent in any given community. There are annually sold in Tulsa about 15,000 licenses for hunting and fishing; or about 1 out of 10 of the population. This ratio holds true throughout the Nation according to reports of the wildlife committees. So, in our case, if each licensee spends only $10 a year in equipment and supplies it means that $150,000 is circulated among the merchants handling sporting equipment.

To analyze the figures in the report of our water department auditor on the revenue collected on Spavinaw Lake alone, we find that for the fiscal year ending May 1, 1935, $7,480 were collected for permits and rentals. Of this amount $4,608 were for fishing permits. These permits cost 25 cents for the daily and $5 for the annuals. In other words, an average of three daily permits to the dollar or a total of 13,824 fishermen. We believe that that number of fishermen who will naturally spend several dollars a day, have proven the cost of operation of our hatchery, which is less than $6,000 annually, to be a small investment for the perpetuation of such an industry, and it costs the taxpayers nothing. The revenue collected on municipal waters is set aside in the fishing and hunting license fund, and the hatchery is operated from this account.

The fact that we produce an annual crop of 500,000 fingerling fish each fall to release in municipal waters is to many of our citizens only incidental. There are those who look upon it as a worth-while project as an educational and park feature alone. The hatchery is located in Mohawk Park where thousands of visitors spend their leisure time. One of our mistakes in planning the hatchery was inadequate parking space. We have room for 50 cars, and on Sundays many visitors are forced to walk or wait their turn to park and explore the grounds. Natural history students from our schools and university use our hatchery for field study. We supply the classrooms with specimens of native fishes for aquarium study. We believe future conservation to be a matter of education in a practical

demonstrative manner, and a municipal fish hatchery will perform a valuable service in that respect. We distribute mosquito destroying fish to everyone who wishes them for their lily pools. In fact we are besieged on every hand by persons interested in the propagation of fish, both as pets and for food and sport. The public's enthusiasm is emphasized by every inquiry. We welcome them. It is a growing business, and city officials from many States are realizing that fish propagation and the activity it stimulates, such as boating, hiking, and camping is a sure-fire method of helping the taxpayers to overlook the burden of bonded indebtedness which most reservoirs require.

There are many advantages in the municipal ownership of reservoirs for future fishing. Particularly because most States permit cities to make their own regulations regarding the use of such property. That is of course, they may further restrict the taking of fish and game, but may not increase either State or Federal bag limits. Many State laws are lax regarding closed seasons and bag limits such as ours in Oklahoma. So the city of Tulsa has their own ordinance which permits the closing of spawning areas for any desired period and limits the catch both to size and bag.

We do not believe we are duplicating any effort of the State game and fish department. We feel that with the tremendous increase of lakes and reservoirs their hatchery production is needed for years to come. After all, each city is a part of the State and too many communities expect the horn of plenty to supply the desirable things of life without effort in return. I might also add that we are free from the usual round of political interference which accompanies each change of administration in most State governments. We are entering our sixth year of operation and expansion without having had one single delay or shake-up in our program due to political changes. This is evidence in itself of the progressive determination of our city officials to be guided by sound economic principles above all odds, regardless of consequences. It is also unusual that they have received no complaint from disgruntled parties regarding this particular adjunct of city government.

Particular consideration should of course be given the sanitary condition of any public water supply. The city of Tulsa has a complete chemical laboratory at the filtration plant where hourly tests are made under the direction of a very able chemist, Mr. A. B. Jewell, who has supplied the data shown in the following chart. This report is rather lengthy and will be omitted at this time. It is available for study to anyone who wishes such information.

Month	Turbidity	B. coli index per 100 cc	Delivered water B. coli index 100 cc	Month	Turbidity	B. coli index per 100 cc	Delivered water B. coli index 100 cc
January	6	1.5	0	July	40	18	0
February	4	1.1	0	August	5	18.5	0
March	50	19.6	0	September	4	4.8	0
April	60	68	0	October	6	10.7	0
May	14	57	0	November	10	11.2	0
June	65	125	0				

This report shows that the B. coli index is directly proportional to the water turbidity. Local rains do not affect the turbidity of Spavinaw Lake to any extent because practically all of the immediate watershed is heavily timbered land. Lake turbidity is caused by the inflow of mud from Spavinaw Creek during heavy run-off in Arkansas. The coli index shows that what pollution is received comes from sources beyond the control of the city and no amount of local fishing or other use of such reservoir seems to have any effect on the count. Mr. Jewell has the following to say in this regard: "It is desirable from a sanitary viewpoint to eliminate use of watershed insofar as possible. However, it is felt that pollution from local source is smaller than from source further upstream as indicated by turbidity measurements." Another factor to be considered is the large dilution. The lake is constantly overflowing except in extreme dry weather. There are not many fishermen in proportion to the size of the reservoir, and there are no cities emptying sewage into the creek above, or on any of the 400 square miles of watershed.

All the above-mentioned physiological factors must of course be accounted for in advocating the use of municipal reservoirs for public fishing. There are perhaps instances where it would be prohibitive from a health standpoint. In our case it is considered more advisable to allow access to the lake under close observation and regulation, where sanitary conveniences are available, rather than have the public concentrate on the stream above the lake where sanitary facilities are entirely lacking. Especially since close analysis shows that all pollution comes from that source.

The public has been very generous in cooperating with the authorities regarding the intelligent use of the reservoir. They appreciate the fact that unless proper precaution is exercised, their outing privileges will be revoked. The lake custodian and patrolman inspect all equipment, and have full authority to revoke permits and order from the property any persons who refuse to abide by the regulations. Copies of such regulations are printed in condensed form on the back of each permit issued, and large posters are stationed at strategic points on the lake. I have a condensed copy of the rules should anyone be interested.

I hope you will overlook the fact that this paper has dwelt largely on our own system in Tulsa. We have used this means of attempting to show what can be done by careful progress. We do not advocate the general use of every public water supply for angling purposes, but we believe many communities can provide a new source of outdoor recreation for their citizens by working out their own solution to the problems involved. We wish to extend our cooperation to those interested, our past experiences are at your disposal. I speak for the entire official family of Tulsa, Okla., in pledging their support to the success of this conference and the future of true conservation.

Fish Yield on the National Forests (Region Nine)

(By Leslie S. Bean, Assistant Regional Forester)

The increment of capital known as interest is computed by the financiers to the smallest decimal point. The farmer knows to the bushel the productivity of his land and even the game manager delving into a new and untried field measures to the bird the population of grouse, quail, or pheasant his estate will support.

These men also know that under certain improvements in either capitalistic methods, farming or game management increases in the returns of interest, are to be expected in proportion to the worth and execution of the improvements.

But would the financier or the farmer or game manager put money into an enterprise on which they knew not the returns? To be more specific, would you expect the banker to loan you $10,000 on $100 worth of collateral? What interest would he expect from such a deal? What return even of his $10,000 capital investment could be expect?

A determination of the increment of fish of various species in their varied environments is a difficult undertaking. It can be done, however, and this paper is a feeble attempt in outlining the steps whereby the work may be initiated and carried forward.

In the first place, there must be a selection of study areas carefully made with the following restrictions and guides in the selection:

(*a*) Normal, fully stocked waters must be chosen which are neither despoiled by man or nature and which are producing to the height of their respective abilities.

(*b*) Normal waters should be chosen which possess various degrees of quality in producing fish or, in other words, a range of lakes and streams selected which will represent poor, medium, and good site qualities for at least the most important game and commercial fishes.

The determination of whether a lake or stream is of a normal condition and fully stocked with the species of fish present must entail a study of the population of the different species of fish, and, furthermore, a study of the various factors of the environment whether they be of the physical, chemical, or biotic group. The influence of factory wastes, erosion debris, overfertilization (pollution), etc., all tend to unbalance the normality of a body of water.

Also, the result of overutilization, understocking, is not indicative of normal waters. Population studies are therefore desirable and can be accomplished by the following method as worked out by David H. Thompson and Francis D. Hunt, of the Illinois Natural History Survey.[1] One-inch mesh hoop nets are used to catch the fish and as they are caught, they are sorted and measured, and finally marked by clipping a fin, care being exercised to clip the fin (pec-

[1] Communicated at the First North Central States Fish & Game Conference, Urbana, Ill., December 1935. "Population Densities and Fish production in Illinois", by David H. Thompson. This method will be described in an early number of Biological Notes of the Illinois Natural History Survey.

toral or ventral) close to its base. Being thus marked the fish can be readily recognized for several months or even years. Fishing stations are established around the lake and the number of marked fish recaught when compared to the number of unmarked fish caught is used to determine the total population. Thus, as Dr. Thompson points out, "If the number of marked black crappies in the lake is 10,000 and subsequent fishing operations show that in the general population one fish in 200 is clipped, then the total population of black crappies in the lake at that time is 200 times 10,000, or 2,000,000."

By clipping a different fin each year the death rate for each age group can be determined.

Such a survey must be mechanical and void of as much of the "human element" as possible.

Normal lakes and streams will not all produce the same increment of fish because of the difference in their character. Therefore, a study of the environmental factors is necessary, such as determining the organic content of the water, mineral content, acidity, area of different bottom types, dissolved O_2, area of weed beds, and so forth. The effect of these factors on lakes and streams naturally divides them into different site classes or qualities.

The site quality is characteristic of the growth rate of the fish. Chauncy Juday,[2] of the Wisconsin Natural History Survey, states that 50 to 100 fish of each species for each lake or stream is necessary to give a definite idea of the rate of growth. The rate of growth of a species or, in other words, the ability of the site to produce that species of fish. For example, if in 5 years, *Catostomus commersonii* grows to a length of 10 inches in one lake, but during the same period only 6 inches in a different lake, certainly the quality of the first lake is better as compared to the quality of the other lake.

So much for the first consideration of normal lakes and the various site classes to be found in them. Next should come a consideration of the effect of latitude and altitude on fish growth. From even casual observation it is apparent that a division of "yield areas" occur, based upon the growing period in various portions of the country, whether these areas be based on different bands of latitude or on differences in altitude. It is, of course, a proven fact that bass grow much larger and with greater rapidity in waters where the temperatures are high enough to permit annual feeding. It is believed, therefore, that yield determinations worked out in one area will not be applicable to other areas and that either different yield studies must be made on each general zone of ecologically similar areas or correction factors employed.

Finally, a correlation of the data on normal waters of various site qualities would evolve itself into the compilation of yield tables and, for sake of example, let us take the findings of the work of Dr. Samuel Eddy (unpublished), of the University of Minnesota, on lakes within the Superior National Forest (summer of 1935).

Dr. Eddy procured the following data relative to the common sucker:

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[2] C. Juday and George W. Bennett, 3d Rept., "Growth of Game Fish in Wisconsin Waters." (Wisconsin Geological and Natural History Survey, May 1935.)

Index to site classes based on increase in length of Catostomis commersonii (common sucker), by year classes

Age class (years)	Length in inches				
	Poor site		Medium site, average	Good site	
	Minimum	Lower limit of medium growth		Upper limit of medium growth	Maximum
1	1	1.5	2	2.5	3.5
2	2	2.5	3.5	4.5	6.5
3	3	4.5	5.5	7.5	10.5
4	4	6.5	7.5	9	12.5
5	5.5	8	9	11	14
6	6.5	9.5	11	12	14
7	8	10.5	12	13	15.5
8	10	12.5	13.5	14.5	16
9	11.5	13.5	14.5	15.5	17
10	13.5	15.5	16	17	18.5

The lower and upper limits in the above table were arrived at by merely calculating one-third of the growth between the average and maximum and average and minimum and adding this figure in the first case to the average and subtracting to get the lower limit. The data was figured to the nearest half-inch class only.

Although Dr. Eddy's party could not study the population of fish this last summer, this data will be added as soon as possible.

Once the research men have, for each important species of fish, determined by the study of normal lakes and streams the site indexes and stocking on these various sites, they can turn their attention to the take and conduct a study of the success of hook-and-line fishing, netting, and various other methods employed in the lawful capture of fish.

The Michigan Conservation Department has made a series of tests on summer and winter fishing[3] conditions as well as the Forest Service of region 9.

The take on fish on several lakes and streams within the national forests of region 9 are of interest. On Lake Winnibigoshish, in the Chippewa National Forest, a ton (2,000 pounds) of pike-perch were taken daily for several weeks during the height of the fishing season.

Several trout streams have been found to produce an average of one-half of brook trout for every man-hour of fishing.

Lake Mitchell, on the Manistee National Forest, produces 0.537 pound of small-mouthed bass per man-hour of fishing while on the same forest, the Pine River produces only 0.040 pound—a wide variance in the fishing take of small mouth of two bodies of water on the same forest. But the take of rock bass in the Pine River is 0.178 pound per man-hour and only 0.045 in Lake Mitchell.

The total take of all species on Lake Mitchell per man-hour is 0.35 pound and on the Pine River only 0.11 pound, the lake allowing a greater take than the river.

[3] Field and Stream, May 1935, H. Titus.

Furthermore, the effects of predators, disease, etc., should be studied. Again Michigan has some valuable research on this subject as attested by J. C. Salyer's report.[4]

Finally, the annual take of fish by species for each site class could be determined somewhat on the order proposed by Bojkov[5] and a simple formula of the plan evolves itself into something like the following:

$$\text{Annual field by age class} = \frac{\text{Population by age class} \times \text{annual increment by age class}}{\text{Mortality}}$$

Mortality should be construed to include the fishing take, loss by predators, and loss by disease.

The correlation of volume as determined by the thermocline and absence or presence of dissolved 0_2 in the hypolimnion is of importance in the total yield of a lake but not of very great importance in determining the rate of growth.

CONCLUSION

The study of normal lakes and streams has a practical use in comparing their quality and yield with other bodies of water. The question of how many fish this or that lake could or should produce is now an unanswered interrogative. If a lake is choked with logging debris, such as bark, sawdust, and deadheads, what gains are there to be had if men continue to argue whether it is producing a normal amount of fish or not, if only opinions or prejudices are their guides? However, if a comparison between this lake and a narmal series of lakes could be made for a specific species of fish, guessing and preconceived notions would be quickly buried with the culture of the stone age.

If this or that lake or stream could be compared with lakes of various normal qualities, certainly the production could be defined and a genuine degree of accuracy reached.

Some fishermen "crab" that a lake is depleted because they fail to get fish each and every day. Will our hatcheries continue to dump fish in Long Lake because the president of the Podunk State Bank is unsuccessful in his piscatorial pursuits or will a trained investigator, by comparison of Long Lake to a series of normal lakes, decide in an accurate scientific way whether Long Lake is really fished out or the president just a "rotten" fisherman?

A little money spent now in getting some fundamental research under way and accomplished is going to save a great deal of money for Johnny Q. Taxpayer.

References: Dr. Embody, "A Biological Survey of the Genesee River System", New York Conservation Department, Albany, N. Y.; Emmeline Moore, "A Biological Survey of the Mohawk-Hudson Watershed", New York Conservation Department, Albany, N. Y.

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[4] J. C. Salyer, rept. 156, July 5, 1932, Institute of Fisheries Research, Ann Arbor, Mich.
[5] Dr. A. D. Bojkov, Trans. Am. Fish. Soc., 1932, pp. 307, 316.

Importance of Forage Fishes

(By Gerald P. Cooper, Institute for Fisheries Research, Ann Arbor, Mich., Department of Conservation, and University of Michigan)

The extent of game-fish production in our natural waters is determined mainly by two factors—the supply of young and the amount of food which is available for them to eat. The amount of shelter, genetic potentialities of the stock, predators, parasites, diseases, the more indefinite "space" factor, etc., may be of importance in some localities but on the whole they are probably relatively less important than food in limiting the production. If then any body of water continually receives a sufficient supply of young game fishes suited to its physical environment the production will, in general, depend upon the food supply.

Most of the larger species of fresh-water game fishes of North America feed more or less upon fish. The extent to which these various species feed upon other fishes varies considerably, and the extent to which any one species feeds upon fish varies greatly with size and age and possibly with season and geographical range.

Forage fishes include those species whose chief economic importance to man is their contribution to the diet of the game fishes. Most important of the forage species are the daces, shiners, chubs, and minnows of the family Cyprinidae. Others of considerable importance are the darters of the family Percidae, some of the suckers (Catostomidae), the top minnows (Cyprinodontidae), and the silversides (Atherinidae). The muddlers (Cottidae) are of especial importance as food for trout. While the young game fish are not included in the category of forage fish, they too play an important role in the diet of adult game fish. In many lakes in Michigan the northern pike feeds to a considerable extent upon bluegills, sunfish, and ciscoes; in trout-rearing ponds in Michigan the writer has found brook, brown, and rainbow trout feeding upon young sunfish and bluegills; it has been suggested that the land-locked salmon in eastern lakes depends almost entirely upon smelt; lake trout are recorded as eating smelt in Adirondack lakes, and cannibalistic tendencies have been noted among the black basses, the perch, the walleyed pike, the northern pike, the trouts, and probably many others. It is conceivable that adult game fish feed upon their own young as readily as upon any other kind of fish, and that the extent to which any particular kind of fish is eaten depends upon size, abundance, and availability.

The value of forage fishes may be considered under at least three main categories: (1) their role in the diet of the game fishes in natural waters, (2) their use as bait for game fish, and (3) their use as forage in game-fish rearing ponds. In actual value as a natural resource the first is probably by far the most important. The ultimate goal of the writer would be to completely evaluate each of the various species of forage fishes according to these three categories. Through this evaluation scientific methods of fisheries management,

lake and stream improvement, and fish culture, with respect to the forage fishes, could be advanced. Unfortunately so little is known concerning the life histories and ecologies of these fishes that a complete evaluation of any one species is as yet impossible. It is possible at this time to give some of the important features in the life histories of many of the forage fishes found abundantly in the Great Lakes region and to state in a general way the type of water in which each species is found most abundantly. In the following discussion, the species are considered somewhat in order of their general abundance.

SOME IMPORTANT-FORAGE FISHES

Common shiner *(Notropis cornutus).*

The common shiner is one of the most abundant minnows of eastern North America. So far as known, it spawns only over gravelly riffles in streams, and this fact probably accounts for its abundance in streams and its almost total absence in lakes. The rather limited spawning season extends from the latter part of May into June, and spawning rarely occurs at water temperatures of less than 60 to 65 degrees Fahrenheit. In diet it is omnivorous and thus only partially competitive with the majority of game fish which are carnivorous. The common shiner reaches a length of about 2 inches at the end of its first year of life. Males grow faster than females and reach a larger size, the maximum length being 8 inches or more. Attempts to propagate this species in ponds have thus far been unsuccessful, and it is doubtful if further attempts would ever be successful due to the breeding habitat required. The large size, hardiness, and abundance of this species have made it an important and popular bait minnow.

Blunt-nosed minnow *(Hyborhynchus notatus).*

The blunt-nosed minnow is very abundant throughout most of interior North America, both in lakes and streams. It deposits its eggs on the under surface of submerged objects; these objects may be boards, logs, rocks, or almost anything if of a suitable size. The male guards the eggs during the incubation period. The blunt-nosed minnow is omnivorous, feeding in about equal amounts on plant and animal materials; thus in food habits it is only partially competitive with your game fish. Due to its long spawning season (May through August), there is a great variation in size of the young at the end of their first year of life. Young hatched in early spring spawn early in their second summer; young hatched late in summer do not spawn until late in their second summer or probably not until their third summer. The maximum total length is about 4 inches for males and 3 inches for females. Due to its abundance in lakes, this minnow is a very important forage fish for the warm water game species such as the pikes, perches, and basses. It has been propagated in a small pond in Michigan at the rate of over 100,000 per acre, and it has been propagated most successfully in rearing ponds at hatcheries as forage for young bass. It is a popular bait minnow, although the writer has found that when crowded into a minnow pail during the warm weather, it is especially sensitive to low oxygen.

Creek chub *(Semotilus atromaculatus).*

The creek chub is a very abundant fish, especially over the northern part of the interior region. It lives almost entirely in streams and spawns during late spring and only over gravel beds near riffles. It is carnivorous in diet. Large creek chubs occasionally feed on crayfish and small fishes. Thus it is entirely competitive with game fish. Since it lives mainly in smaller streams, its food competition with game fish is confined mostly to the trouts. The creek chub reaches a length of 2 to 3 inches by the end of its first summer and 4 to 7 inches by the end of its fourth summer. The maximum age has been recorded as 7 years; the maximum length as approximately 11 inches. Since this minnow seldom occurs abundantly in the same habitat with the warm-water game fishes, it is probably not fed upon to any great extent by them. Where they occur in trout streams, small creek chubs are probably eaten to some extent by trout. There are no records of the species being propagated in ponds, and it is doubtful if this would be possible due to the spawning habitat requirements. However, one author has recorded success in propagating the creek chub by stripping the fish and hatching the eggs on hatchery troughs. The creek chub is a very good bait minnow, large individuals making an excellent pike bait and an attractive decoy for spearing pike through the ice in winter.

Black-nosed dace *(Rhinichthys atronasus).*

The black-nosed dace is another very abundant species to be found mostly in small streams and rarely in lakes or ponds. It spawns over gravel beds in the riffles of streams during the latter part of spring at water temperatures of approximately 70 degrees Fahrenheit or warmer. This minnow is omnivorous in diet but feeds more upon insects than upon the microscopic plants. The maximum length of this species is approximately 3 inches. Since the black-nosed dace is found abundantly in trout streams it is probably a serious food competitor with trout, but it is also eaten to some extent by the larger trout. Being a stream spawner, it is doubtful whether it could be propagated in ponds. Due to its abundance in many warm-water, nontrout streams, from which it can be legitimately seined, it is an important bait minnow.

Golden shiner *(Notemigonus crysoleucas).*

The golden shiner occurs over the eastern half of the United States, where it is abundant in lakes, ponds, and the still waters of the larger rivers. It spawns from May into late summer and deposits its eggs throughout masses of filamentous algae. Its diet is mainly carnivorous, consisting mostly of micro-crustaceans. On the average this species reaches a length of 3 inches by the end of its first summer of life, 4 inches by the end of the second summer, and 5½ inches by the end of the sixth summer. A maximum age of 9 winters and a maximum length of approximately 1 foot have been recorded for the species. The golden shiner occurs abundantly in lakes along with many warm-water species of game fish and as a natural food for bass and pike. It is undoubtedly one of the most important of the forage fishes. This species has been propagated in small ponds at the rate of 100,000 to 250,000 per acre, and it is also a valuable minnow

in bass-rearing ponds as forage. It is one of the more desirable of the bait minnows.

The fat-headed minnow *(Pimephales promelas)*.

The fat-headed minnow is found quite commonly in the north and the southwest. Toward the northeast it is generally less abundant than the blunt-nosed minnow, the common shiner, the golden shiner, and the creek chub, and is usually found most abundantly in the smaller lakes and ponds and in boggy or sluggish streams. Its general life history is much like that of the blunt-nosed minnow already discussed. It lays its eggs on the under surface of logs, boards, and rocks, the males guarding the nest. It has a long spawning season, from May throughout most of the summer. The most intensive study on the food of this minnow has indicated that it feeds chiefly upon algae. It is quite probable, however, that animal food is taken to a considerable extent. During experiments at the United States Fisheries Station at Fairport, Iowa, Mr. Markus has observed the fat-headed minnow to grow to maturity and spawn in its first summer of life. In the colder waters of the Great Lakes region growth is less rapid and the species does not mature until the second summer. The maximum length of this species is approximately 3 inches. In natural waters the fat-headed minnow is probably not important as a forage fish because it lives mostly in the smaller waters. It has been propagated in small ponds at the rate of over 200,000 fish or 328 pounds per acre, and has been successfully propogated in bass-rearing ponds as forage.

Northern red-bellied dace *(Chrosomus eos)*.

The northern red-bellied dace is found quite abundantly throughout the northeastern part of the United States (New York, Michigan, and Wisconsin) and throughout much of the southeastern part of Canada. It inhabits mainly the smaller lakes, the bog ponds, and the sluggish streams. In Michigan the spawning season has been found to extend from May into August. The eggs are deposited in masses of filamentous algae. Those young which hatch early in spring reach maturity early in their second summer. The species has a maximum length of approximately 3 inches. It has been recorded that this minnow is mainly herbivorous, feeding upon algae. It therefore does not compete to any great extent with trout for food. In the small lakes and ponds and in the sluggish streams of the northern parts of New York and Michigan this minnow is probably an important forage for trout. The writer has propagated this species in a small spring-fed pond at the rate of over 125,000 per acre. It unquestionably has possibilities as a forage fish to be propagated in trout-rearing ponds. It is an extremely hardy minnow and a good bait for the smaller game fishes such as the rock bass, the crappies, and the perch.

Gizzard shad *(Dorosoma cepedianum)*.

The gizzard shad occurs very abundantly in the larger rivers of the Mississippi Valley, and less abundantly along the Atlantic coast and in the southern part of the Great Lakes drainage. According to Mr. M. B. Trautman, the shad is very prolific and spawns in open water in the spring. The shad feeds to a large extent upon plankton and therefore competes only with the very young of the game species

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Mother and daughter feed antelope on the Wichita Mountains Wildlife Refuge, Okla. (Forest Service photo.)

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Two young flickers in their nesting stronghold clamor for food. (Forest Service photo.)

for food. It reaches a maximum total length of approximately 18 inches. The excellent bass fishing in certain lakes in Ohio and Kentucky has been attributed to the abundance in these lakes of the gizzard shad, which constitutes the chief food supply of the bass The shad has been successfully propagated in bass-rearing ponds in Ohio as food for young bass. The young shad are so delicate and difficult to transport that they are of little or no value as bait.

Other important forage fishes

The black-chinned shiner (*Notropis heterodon*) and the black-nosed shiner (*Notropis heterolepis*) are abundant lake species occurring throughout much of the Great Lakes region. Both species have a maximum length of approximately 3 inches. Little has been published relative to their general life history and ecology. Both species are very important forage fishes for bass and other game fish of weedy lakes. While no attempt has been made, to the writer's knowledge, to propagate these two species in ponds, both are probably suitable for pond propagation.

The lake shiner (*Notropis atherinoides*) is one of the most, if not the most, abundant species of fish in the Great Lakes. It is probably the most important item in the diet of the fish-eating fishes in these waters. Each winter it congregates at the mouths of many of the larger rivers in Michigan in enormous numbers, and at this time dealers seine up great quantities and transport them to the inland lakes where they are sold as bait.

The Menona killifish (*Fundulus diaphanus menona*) occurs in many lakes throughout the Great Lakes region, where its abundance suggests that it is an important item of food to the game species. It spawns during late spring or early summer, depositing its eggs in masses of filamentous algae. It grows to a maximum length of 3 inches. The writer has been able to propagate this species in a small pond at the rate of approximately 80,000 per acre. It is a promising species for propagation as bait and as a forage in bass-rearing ponds.

The lake chub sucker (*Erimyzon sucetta*) occurs commonly in weedy lakes and in the quiet, weedy sections of streams. It has been found to scatter its eggs throughout masses of filamentous algae, over beds of aquatic moss, and over submerged plant roots. The maximum length of 10 inches is reached in about 5 years. It occurs commonly in warm-water lakes along with bass, perch, and pike, and it has been propagated successfully in trout rearing ponds where it was an important forage for the trout. Thus far in pond propagation, the chub sucker has given a rather low production in number of fish, but the relatively few fish grow rapidly. The species is very hardy and the large individuals are popular as bait for large game fish. It might therefore be profitable business to propagate this species for sale as bait.

The darters, a group of small fishes related to the perch and walleye, are probably of more importance as forage fishes in our natural waters than has generally been recognized. The Johnny darter (*Boleosoma nigrum*), the log perch (*Percina caprodes*), and the Iowa darter (*Poecilichthys exilis*) occur abundanty over part or all of the Great Lakes region. All occur quite abundantly in many

lakes. Their habit of remaining near the bottom most of the time probably accounts for the fact that many sportsmen do not even know of the existence of this group of fishes. During recent studies on the food habits of bass from Michigan lakes, the writer has found the Johnny darter and log perch to be important forage fishes. The Johnny darter is well suited to pond propagation, but whether or not such a venture would be justified by the returns cannot be stated at this time.

FORAGE FISHES AND CONSERVATION

The most important function of forage-fish research, as it pertains to the conservation of the sport fisheries, is the development of methods to increase the supply of these fish food organisms in our natural waters; the most important task of forage-fish management is to put these methods into practice. These methods are embodied in three main categories: (1) A control of the removal of minnows and other forage fishes from waters where they are of considerable importance as food for game species, (2) environmental improvement to favor their reproduction in natural waters—a subject which is being discussed during this conference by Mr. Tarzwell—and (3) the introduction of species of forage fishes into waters where they have not previously existed or from which they may have been exterminated by the severe predation of game fish or by other causes—a subject which is being discussed by Dr. Hubbs. The beneficial results of increasing the forage-fish supply in any body of water are twofold; a greater supply of food is furnished for those game fishes already present, and the increase of forage organisms relieves the predation pressure on the young game fish many of which would otherwise be eaten by adults of the game species. Each of the methods here mentioned of promoting fish conservation through management of the forage fishes has been in practice, to a limited degree, for some time. Perhaps the most severe, justified criticism of current forage-fish management is that these methods have not been put into practice to the extent to which the expected results would seem to justify.

DISCUSSION

Mr. W. J. K. Harkness (Toronto). Have you found the yellow perch of any importance?

Mr. Cooper. We have several lakes in Michigan where yellow perch have pretty well cleaned out all fish. About the only food for the large perch are smaller perch.

Mr. Harkness. Some of our lakes are comparable to those of northern Michigan. The small perch not more than 5 or 6 inches in length seem to be the food supply of wall-eyed pike.

Chas. O. Hayford (New Jersey). In New Jersey we have come to realize more and more the value of the minnow. A short time ago we could find plenty of minnows, but now there are no minnows to be found. I believe in a very short time the propagation of minnows will be considered just as important as the propagation of large fish. That is, we have found it that way in New Jersey.

Glenn C. Leach (Washington, D. C.). It is very important that all States should give consideration to production of minnows in

streams. We should not have promiscuous removal of fish. We cannot take the food away and then expect the streams to produce fish. We have to protect minnows.

Kenneth Reid (Pennsylvania). I make a clear distinction between trout waters and bass waters or cold waters and warm waters. It has been my experience throughout the Eastern States in trout waters that minnows, in practically all large trout streams full of minnows, are perhaps more competitors for trout food than food themselves. It seems that in fishing, at least 9 out of 10 man-hours are put on trout fishing and not on minnows, and therefore man's activity reduces trout supply. The fewer the trout, the more the minnows. I question the advisability of stocking minnows in trout streams.

Prof. G. E. Potter (Texas). This discussion is very interesting. We have golden shiners in east Texas, shad, fatheads, and a few others. We use the fathead, and have found it better for actual use than the golden shiner. We make some use of red fin. That is a very abundant shiner which is fairly useful. Also the stone roller is being used. Some use the spot tail. It is a little cannibalistic, also rather large. The top minnow is one of our common ones. Also the mosquito minnow is common. The top minnow lives on other fish some, but primarily on mosquitoes and insects. We use, of course, quite largely, the fathead and some of its relatives. We have come to the state of mind that in the next State legislature we will try to get passed a law allowing no minnow dealer to sell minnows unless he has reared them or purchased them wholesale from someone who has reared them.

Mr. Glenn C. Leach (Washington). What he said about minnows being competitors to trout is true. Eastern States must produce larger trout to put in streams so as to overcome this. The larger fish will take care of the minnows we have been complaining about. We have got to put in larger trout, so that should answer that particular part of it.

Russell Lord (Vermont). Speaking along the lines of Mr. Leach, the White River in Vermont turns out some good trout, but small fly would catch nothing but minnows. Bucktail would catch trout. In our next test water investigation we are including an artificial lake which turns out lots of trout. One man caught 50 pounds in that lake. Those streams, where dammed up, contain horned dace. They are so thick that you don't need to bother about bait. To procure the dace tails you just scoop them up. These dace grow to a foot in length. They swarm there.

Prof. G. E. Potter (Texas). I will tell a story, too. Take these top minnows. You can go out to almost any pond—no net needed. I use an old broom and just slap out the minnows I need.

Restoration of Atlantic Salmon to the Penobscot River

(By Raymond W. Dow, Penobscot River Salmon Committee, Bangor, Maine)

In most countries to which he now migrates the Atlantic Salmon (Salmo Salar) is esteemed a natural resource of great value, both from the commercial and sporting viewpoint. As full appreciation of this has dawned, wise regulation has given this splendid fish

an increasing degree of protection. Where this situation exists the salmon is amply repaying the time and money expended on him. Unfortunately the reverse of this treatment has prevailed in a few of his natural migratory homes, with the result that he has been thoughtlessly destroyed, his procreative instincts thwarted and his gradual extinction regarded with indifference.

In the United States the Atlantic salmon now exists in appreciable (but diminishing) numbers in only one river—the Penobscot in Maine. In lessor numbers he exists in one or two rivers to the east of the Penobscot. His survival in the Penobscot has been largely due to persistent efforts on his own part to surmount ineffective fish passes of faulty design and to continuous planting of hatchery fry in the upper waters. It is a tribute to the former and to the potential greatness of the Penobscot as a salmon river that the fish has survived at all. The problem of the salmon's survival is closely associated with the state of the river, briefly outlined as follows:

The Penobscot River Basin lies wholly in Maine and comprises about 8,500 square miles, or about one-fourth the area of the State. The East and West Branches of the river are large river systems in their own right. The West Branch rises in the mountainous region near the Canadian border and flows in a general southeasterly direction for more than 100 miles, with a drop of 800 feet, to its junction with the East Branch at Medway. It drains in its course a territory comprising about 2,100 square miles.

The East Branch, the natural watershed of which was changed in 1840 by an artificial connection with certain waters of the St. John River Basin, flows easterly and southerly through lakes and rapids a distance of 75 miles, with a drop of 700 feet, to its junction with the West Branch. Its drainage area comprises 1,200 square miles. The East Branch is a wild river flowing through a remote section of the State, inaccessible for most of its length except by canoe, and in former times the great breeding place of the Penobscot River salmon.

From the junction of the two branches at Medway the river flows southerly a distance of 75 miles, with a drop of 230 feet, to tidewater at Bangor, thence 27 miles to its mouth in Penobscot Bay. The river south of Medway is augmented by several tributaries of large size as well as many smaller streams. The entire system contains approximately 1,600 tributary streams.

Originally, or until about the year 1830, the river and many of its tributaries contained no serious natural obstacles to the ascent of salmon. There was no rod or sport fishing during those early days but extensive commercial fisheries were operated. In lower Penobscot Bay, including the Camden nad Islesboro region, pound or trap nets were in use. From Castine and Searsport north as far as Orrington and Hampden the fish were taken in weirs. North of Hampden gill nets were used, and in some places gill nets were operated as drift nets, particularly at Bangor, Veazie, and Eddington. Immense quantities of salmon were taken which were used in barter for other goods. The value of salmon per pound, on account of the great numbers available, was at that time very low, being only a fraction of the value of cod for trading purposes.

At that period salmon ascended freely to the East Branch and its tributaries, and to some extent to West Branch waters, as well

as some of the other large streams entering the river. During the summer they assembled in pools along the upper reaches much as they do now in the Canadian rivers. There is no apparent reason why those conditions should not have afforded splendid rod fishing, particularly along the many miles of the upper waters of the East Branch, Seboois, and Wissataquoik. In support of this it is recorded that the first salmon taken on the river by artificial fly was caught by Bangor anglers at the mouth of the Wissataquoik in 1880. This was several years before the sport of fly fishing was inaugurated on the Penobscot at the Bangor Pool. Those great natural runs of salmon through an unobstructed river ended, however, about 1830 and the few years preceding undoubtedly saw the height of commercial salmon fishing on the Penobscot.

The first serious obstacle to the ascent of salmon came with the building of a dam on the main river at Oldtown in the year 1830. In 1834 a dam was built at Veazie which for several years was impassable to salmon until the washing away of the left bank uncovered a crevice which permitted the fish to pass. Other dams began to appear on the river and with them came a drastic decline in the run of salmon which has continued up to the present day.

A striking example of the effect of these dams may be drawn from the following: In the early days the town of Orrington owned three weir sites along the river which were rented from year to year on a share basis. During that period the price of salmon was extremely low, yet from 1824 to 1838 the rental ranged from $124 to $530 per annum. By 1839 the damaging effect of the dams built in 1830 and 1834 began to be felt to such an extent that the rental for that year dropped to $13.70. During the next 40 years the rental never exceeded $50 and toward the end of the period there were occasional years when the weirs were without value.

Since the dams were built the opening of fishways has permitted a few salmon to reach the spawning grounds and the situation has been further helped by the planting of fry from the Federal Hatchery at Orland. This has enabled commercial fisheries to continue, although on a much reduced scale. The records for 1880 show about 172 weirs in operation and 65 pound nets which annually accounted for about 10,000 salmon. For the past few years only a small number of weirs have been operated, the number ranging from 30 to 65, depending on the salmon run. The number of salmon taken is now of small importance commercially.

Although of late years comparatively few fish have entered the river to spawn, there is persistent evidence of a considerable number of salmon in the outer coastal waters of Maine. For a number of years a record has been kept at Portland of the salmon brought into that port by the commercial fishermen from Casco Bay. They are fish that have been taken incidentally in the pursuit of other fisheries and the figures reported at Portland are estimated to be about one-third of the total number so taken. The figures are more impressive when it is remembered that most of the salmon that enter pound nets or mackerel drift nets escape by jumping over the float line. The period covered is from May to September inclusive, and the average taken per year is about 200 fish. The largest number recorded was in 1921 when approximately 700 salmon were taken.

The years of smallest record were 1920 and 1926 when 15 and 20 fish respectively were taken.

These records show a certain peculiarity when compared with the rod records at the Bangor Pool. The best year on record at the pool was 1926 when a great number of salmon entered the river and rod fishermen took a total of 354 fish. In the same year only 20 salmon were taken in Casco Bay waters. Contrasted with this is the year 1932 when 372 salmon were taken in outside waters and only 82 at the Bangor Pool. The years 1927 to 1931, inclusive, were comparatively good years at the pool while affording abnormally small catches at Casco Bay.

The above comparison may have no great significance, but the fact that an average of 200 salmon per year are incidentally caught at a place so far from the mouth of the river, argues a large potential supply of salmon in the outer coastal waters of Maine that may eventually ascend the river if the obstruction problem is solved. When and in what quantities these fish will enter the river is a question, but it is natural to suppose that at some time all of them will be overtaken by the spawning urge, and all should eventually return to the river. Presumably they all originated in the Penobscot as a result of hatchery plantings in the upper waters.

The period of time salmon remain in the ocean before returning to their native river to spawn is a matter of which we have little knowledge, particularly as pertaining to the Penobscot. Dr. William Converse Kendall in his book, The Fishes of New England, from which this paper has drawn freely, cites a scale study of 41 salmon taken in the aforementioned Casco fisheries. Five of these salmon were of the smolt stage, having spent 2 years in fresh water as parr and part of the summer (during which they were taken) at sea. Eleven were grisle, with 2 years of parr life and one winter in the sea. Five were grisle with 3 years of parr life and one winter at sea. Thirteen were salmon, with 2 years of parr life and 2 years at sea, while seven were salmon with 3 years of parr life and 2 at sea. Dr. Kendall states that none of the fish had spawned and there was nothing to indicate when they would have spawned.

It is apparent from the above that the survivors of the recent stocking operations in upper Penobscot waters will not all return to the river the same year. In fact, there is abundant evidence that these fish may straggle back into the river at periods from 4 to 10 years after the date of planting. It is possible that some reliable information on this subject could be obtained by examining the scales of kelts, a few of which are taken by fly fishermen at the Bangor Pool each year, and a few are also found in the weirs on the lower river. Where these kelts come from is somewhat of a mystery. It is supposed that since the sluiceway was closed at the Bangor Dam several years ago, no fish could get by that dam, as the fishway has long been regarded as of no use whatever on account of faulty design and poor location. It is possible that a very few fish may spawn at some location below the dam, but very doubtful if any get by the dam, except at unsual stages of water.

From time to time since the era of dam building, the situation with respect to survival of the salmon has been regarded as acute, and various reasons have been advanced to account for the diminishing runs. Pollution, excessive netting, dynamiting, poaching, ob-

structions, and other theories have been recorded. The best authorities, however, have long been convinced that the real source of trouble lay in obstructions. The Honorable Charles G. Atkins, who for a number of years was superintendent of the United States Fish Hatchery at Orland, on the lower river, was the first fish culturist to give serious study to the life and habits of Penobscot River salmon. His work covered a period of years and took in all sections of the river. Since his time, with the exception of the work done by Dr. Kendall, no further research has been made. In 1880 he recorded that "the early dams on the Penobscot River and tributaries were built in utter disregard of their effect on the fish, and in the majority of cases no adequate fishways were provided." The few fishways that existed that might be termed "adequate" probably merited the title through accident in being favorably located, as little was known of the correct principles of fishway construction at that period.

The situation then was probably the same as it is today in that one or two bad passes on the river, by their obstructive influence could nullify the good effect of all the other passes, and apparently at that time very little research was attempted to decide the question of which were the good and which the poor fishways. Scientific knowledge of fishway construction has advanced rapidly, however, during recent years, and in the light of this new knowledge it is certain that none of the fishways on the river today are really effective in permitting the passage of salmon.

Not only are they ineffective in this regard, but in the case of the dam at the Bangor waterworks there exists a positive obstacle to the passage of all fish. Prior to the year 1923 there existed at this place a fishway which had been constructed about 50 years before. This fishway was of timber construction and through favorable location and a peculiar type of construction at the intake, was known to have attracted salmon and undoubtedly many fish went through it. In 1923 a freshet of flood proportions washed out the Brewer side of the dam and the fishway went with it. A new concrete structure was built which is now recognized as the poorest fishway on the river and probably absolutely impassable to salmon.

That this condition did not effectually block the passage of salmon is due to the existence of an old log sluiceway constructed many years ago for the passage of logs through the waterworks dam. The head of this sluiceway at the dam was open and a moderate head of water permitted fish to get into the sluiceway at high tide and thus go through.

With this sluiceway available the condition of the regular fishway was not of great importance so far as that dam was concerned, but several years ago it became necessary for the waterboard to close the head of the sluiceway to get a better head of water for pumping operations. This eliminated the last chance that salmon had of getting by the Bangor Dam, except through some unusual combination of freshet and high tide and is the condition which has brought about the present emergency.

That the end of the salmon runs in the Penobscot was in sight was recognized several years ago by experienced observers. The need of drastic steps to effect restoration of the fish to the river became more and more apparent. A group of interested citizens carried the

fight to the State legislature and succeeded in getting a law enacted prohibiting the use of gill nets. This important legislation was achieved only after prolonged effort, and constituted only one step in the program. The committee had long suspected the efficiency of the fishways along the river and realized that nothing less than complete replacement of all the fish passes would effect any substantial improvement. This was an undertaking that required a considerable amount of money and the funds were not available. The State fish and game department felt that it could not spare the necessary amount. The Sea and Shore Fisheries Commission, while extremely helpful in studies of the situation were unable to secure an appropriation to carry on the work.

In the meantime the years 1933, 1934, and 1935 had afforded the poorest catches on record at the Bangor pool, while the weir catches in the lower river had dwindled to a point where many operators ceased to bother with the fishery. The committee, however, believed it possible that funds might be available to carry out the project and continued their studies. All available data were gathered, digested, and placed in the hands of the engineers of the State fish and game department for possible future use.

Early in the year 1935 the situation entered a new phase through the efforts of the Governor of the State and the commissioner of fish and game to secure relief funds for carrying on the work. Careful studies were made on the ground by the State engineers with the assistance of the salmon committee and eventually plans were completed for renewing the fishways at all five of the dams on the river. The appropriation for labor and certain items of material was approved by officials of the Works Progress Administration, and funds for two of the fishways—Bangor and Veazie—were immediately released. For these two fishways the State made a contribution to cover the cost of material not provided by Works Progress Administration. Work began on the Veazie fishway late in the year 1935 and is now in progress. It has been favored by mild weather conditions and appears to be headed for an early and successful completion. Work is then scheduled to begin on the Bangor fishway.

The members of the salmon committee are convinced, however, that the completion of the above portion of the project without rebuilding the three up river fishways, will result in very little benefit. The ultimate goal must be a free and unobstructed passage for salmon from the mouth of the river to the spawning beds on the headwaters. Such a passage requires adequate fishways. The committee believes the designs prepared by the State engineers are adequate and that fishways constructed from those designs will function efficiently. The next step in the program is full cooperation with the Works Progress Administration officials in obtaining release of the funds allocated for the three remaining fishways and securing the contingent State appropriation for materials.

The ultimate value to the State and to the United States of a great salmon river with the potential capacity of the Penobscot is incalculable. In the days of its prime and even in recent years Penobscot River salmon have been marketed and esteemed a food delicacy throughout New England. The return of the fisheries to a substantial stage will be of immense benefit to eastern and central Maine. Rod fishing on account of the extremely few fish that have reached

the summer pools on the headwaters, has heretofore and is now confined to the pool at Bangor. With the restoration of the salmon and an unimpeded path to the East Branch and its tributaries, rod fishing should flourish through many miles of a fine scenic section of the State and we should eventually have a river rivalling the great salmon rivers of New Brunswick and Newfoundland.

Not in the memory of men now living has the condition of the river been so favorable for the return of the alewife, the shad, and the salmon as at the present time.

Of the 250 saw mills "built directly over and across the river" (into which their waste was dumped) which once made Bangor the greatest lumber market in the world, not one remains. Gone never to return are the great tanneries (prolific sources of pollution) along with the hemlock forests which called them into being. The innumerable dams built by lumbermen on the upper tributaries are practically all obsolete and for the most part burned, rotted out, or washed away. The Mattawamkeag River, a splendid tributary of the Penobscot, 300 feet wide at its mouth, 72 miles in length, with a drainage basin, for the most part wooded, of some 1,500 square miles, is now for the first time since 1870 free from artificial obstructions from its mouth at Mattawamkeag village to its sources in the highlands of Penobscot and Aroostook Counties.

The "Test Stream" and Fish Management

By Russell F. Lord, in charge U. S. Experimental Trout Hatchery, Pittsford, Vt.

The Pittsford, Vt. trout hatchery is located in a section of the country where good trout waters are the rule rather than the exception. In fact, one of the best trout brooks to be found in Vermont, Furnace Brook, flows through the hatchery grounds. It has thus been very easy to watch the trend of the fishing from year to year, both on this stream and others in the vicinity.

As my interest in trout is personal as well as professional, you can understand that it has not been pleasing to note that the same thing is going on in Vermont as in all places where the anglers find the streams of easy access. Slowly but surely the fishing is falling off despite the efforts of State and Government to help out by frequent restocking.

Clearly, something is wrong. Clearly, some sort of better trout stream management should be in order. Perhaps the stocking methods are all off? Perhaps the fishing regulations are inadequate? One thing is certain: Anything done to improve fishing must consider chiefly these two points, for stocking and fishing regulations are here to stay. The only solution is to see that the kind of stocking done and the kind of laws enforced are really designed for the purpose of securing better trout harvests each season.

At this point we run into the first snag, for who can tell with any degree of accuracy what a typical trout harvest from a good stream ought to be, or who has even the vaguest notion about it? Who knows the relationship between the number and size of fish planted and the subsequent take? The fact is, that year after year we have chiefly been concerned with one end of the problem—that is, the number of fish planted. What becomes of them afterward, how

many fish the stocked streams are producing—well, one man's guess is as good as another's.

All this boils down to the need of securing some reliable angling statistics. This subject was very adequately introduced by Mr. H. G. Clark at the Montreal meeting of the American Fisheries Society in 1934. In his paper, and in the discussion following its reading, the importance of having some measure of the angler's catch was quite thoroughly considered, and what a great difficulty there was in obtaining any degree of cooperation from the anglers themselves. I recall that at the time I did a little complaining myself for I had just had considerable trouble in getting fishermen to assist in determining the annual catch from that trout brook at Pittsford.

Regardless of difficulties, however, I firmly believe that unless some scheme of obtaining angling statistics in different types of trout waters is followed, that the agencies engaged in keeping up the fishing can struggle along until doomsday without any real idea of what they are up against. For years I have entertained the hope that some time a way would be found to set aside certain typical trout waters as proving grounds to ascertain what a normal trout production should be, and what was the relationship between the number of trout planted and the annual catch.

Thus, while yearning for a real "test-stream", several attempts have been made at Pittsford to go ahead and try to secure fishing statistics by asking for voluntary cooperation from the fishermen. The information received was merely exasperating. In most cases I had to interview the angler and practically fill in the card for him, and the total results for the season of 1934 was only 129 fishing reports. In the meantime I estimated that over 1,000 rods had been active on the stream during the summer.

I still clung to the idea, however, that it would be better to get some reliable figures on a few streams—to be applied to the general fishing situation—than to attempt a widespread creel census such as tried out in the State of Michigan. In other words, angling statistics secured from a few "test waters" definitely set aside for the purpose might be expected to yield much more accurate information than can be secured in any other way.

Accordingly, this idea was taken up with the Vermont Fish and Game Service and certain sportsmen's organizations, with the result that the 1935 Assembly of the State of Vermont passed a bill making it possible for the fish and game service to cooperate with the Bureau of Fisheries in a definite "test water" investigation. This bill provides that up to four bodies of water may be set aside at any one time for the sole purpose of securing angling statistics. The Bureau of Fisheries is to carry on the necessary stocking and field work, while the State is to see to it that the regulations pertaining to "test waters" are enforced. Everyone must secure a permit, issued free, to fish "test waters" and is required by law to report the daily catches on cards provided for that purpose. The law further provides that violators are liable to a $10 fine for each failure to comply in full with the regulations.

After due publicity, the "test stream" investigation got under way last year when the Vermont fishing season opened on May 1. Furnace Brook was the first stream selected.

A detailed report of the 1935 trout harvest from Furnace Brook was prepared for the Oklahoma meeting of the American Fisheries Society last September. Today I shall merely touch upon the high lights of the experiment. First, a word as to the exact method of securing reports might not be amiss.

Mimeographed cards were left in mail boxes at different places along the stream. Each box was painted red to attract attention, and a sign explaining the "test stream" investigation was attached to each mail-box support. Pencils were provided for the use of the fisherman, who filled in the cards and left them in the same boxes to be collected by the investigators as desired.

Furnace Brook itself is a clear-water stream, more or less rocky but with a bottom that remains fairly stable except in rare case of extremely severe floods, at which times new channels are sometimes cut. The test area was approximately 4 miles in length and commenced just above a falls which practically stops all upstream movement of fish. The test area was unique in that no other fish except trout are present. Although dace, sculpins, and suckers can be found below the falls nothing but trout have ever been taken above them. Furnace Brook is about 25 feet in width and subjected to heavy fishing throughout its entire length as logging roads penetrate far up the headwaters. Although a 15-inch trout is sometimes taken such fish are usually hatchery escapes. Most of the fish are caught before they have had much opportunity to grow large. Fish food is abundant in the stream. Stomachs of trout contain practically 100 percent insects. The water gets very cold in winter, down to 33° F., and sometimes up to around 70° during a hot, dry summer. Spring seepage is common, and even during hot weather trout take flies freely. Suitable spawning areas are plentiful. Both brook and rainbow trout are established in the stream. Because of the low temperature of the water during the winter, the fish are usually very thin in spring and of poor flavor.

The following table shows the outstanding observations for the 1935 fishing season on the test stream and gives those interested in the future of trout fishing something to think about.

Summary fishing results, Furnace Brook, 1935—Trout season May 1, 1935, to Aug. 14, 1935, inclusive

	May	June	July	August	Entire season
Monthly total:					
Rainbows	1,215	837	602	288	----------
Brook trout	2,770	1,218	1,089	570	----------
Monthly, total, both kinds	3,985	2,055	1,691	858	8,589
Grand total:					
Rainbows	1,215	2,052	2,654	2,942	2,942
Brook trout	2,770	3,988	5,077	5,677	5,647
Grand total, both species	3,985	6,040	7,731	8,589	8,589
Number fishing efforts					
Average number trout per effort	614	257	211	115	1,197
Percentage:	6.49	7.98	8.00	7.46	7.2
Brook trout					
Rainbows	70	59	64	66	66
	30	41	36	34	34

NOTE.—Furnace Brook was stocked during September 1934 with 2,400 legal brook trout. The number of brook trout taken exceeded the number planted before the first fishing month was completed. Rainbow trout are not stocked in Furnace Brook yet are holding up to consistently furnish around 30 percent of the catch annually.

Referring first of all to the efficacy of the "test-stream" method of securing angling statistics it is noted that 1,197 fishing reports were tallied for the season. This is a striking contrast to the meager returns of 129 voluntary reports for the year previous.

The outstanding thing revealed by the summary is the tremendous amount of angling being done by today's fishermen. It was thought at first that the publicity given the test stream would result in a rush of anglers from other parts of the State, thus causing considerable damage to the brook by overfishing. The reverse, however, was true, for when the first month's catch was made public many anglers decided that the other fellows had all the fish and went somewhere else. So, although the stream was fished at least 1,197 times during the summer, such fishing really represented less than the usual amount. Intensity of fishing is typical for the present day. I doubt if many streams can turn out as heavy a yield as Furnace Brook, but they are whipped just as hard in proportion.

When a comparison between the number of fish planted and the number subsequently taken is considered, we note that the first "test-stream" figures reveal something about this too. In just 3½ month's open fishing over 8,500 legal trout were taken from 4 miles of one small brook. During the previous September the stream was stocked with 2,400 legal brook trout which represented a considerable heavier planting than is customary. However, by the 26th day of the first fishing month the number of brook trout taken exceeded the number stocked. This means that fish are being removed much faster than replaced by stocking. It shows without a doubt what the agencies engaged in providing the fishing are up against.

The figures representing the average catch per fishing attempt point to two things. First, that the fishing reports were in the main reliable. Second, that they were fishing an excellent stream. There is a gratifying uniformity in the average number of fish taken by each man during the different months. In May, when the season opened, less trout per fisherman were secured—chiefly because so many anglers were active. During June and July the average number of fish per report was remarkably consistent, and the results for August were very close, indeed. It is a good trout stream that will consistently allow an average catch of six or eight fish for each day spent with the rod, but even a good stream can not be expected to hold up indefinitely.

The catch of rainbows in Furnace Brook is of special interest because no effort is being made to keep up the rainbow fishing by stocking. In fact, at one time no size limit was enforced on Furnace Brook rainbows because the anglers did not like them. The percentage of rainbows in the harvest thus depends upon natural spawning. Rainbows reproduce in Furnace Brook and females with eggs and males with running milt are a common occurrence in the early creels. Thus in some environments rainbows do "stay put." The observations further emphasize the fact that the rainbow is a true sporting fish able to hold its own under heavy fishing, better than the brook trout.

In addition to supplying actual catch figures to support the contention that heavy fishing is in the main responsible for today's lighter creels and that the present stocking seems inadequate, the initial "test stream" study already suggests certain modifications

of the fishing regulations. For example, almost half of the entire season's catch was secured during the first month of fishing and by means of worms. I have mentioned that trout from a stream in which the water temperature reaches a very low point during the winter are not in good shape in the spring, either for the purpose of providing sport or gustatory delight. I will add that early spring fishing in Vermont is a long way from being enjoyable. In fact, it is more in the nature of an endurance contest.

Each man is trying to see who can take the most poor-conditioned trout before his fingers become too cold to hold a rod or bait a hook. Snow flurries, turned-up collars, and red noses are the rule on opening day. I have actually tried to hurry up the fly-fishing season with the aid of mackinaw and gloves and once succeeded in taking a trout on a fly when so equipped. The sad part of early fishing is that anyone able to distinguish one end of a rod from the other can remain by almost any deep pool on opening day and catch up to a dozen trout without moving—providing he does not become petrified in the process.

This seems to me a very poor way of treating both ourselves and a splendid game fish like the trout. The same fish that comes in like so much dead weight during the early fishing would give the fly fisherman something to rejoice over for weeks. But alas, by the time apple blossoms and new green leaves and the smell of growing things are in order our trout streams have already taken an early season whipping from which they never recover.

A little over 40 percent of the season's catch was taken during the first month of fishing! They were trout that had no opportunity of getting into condition after the hard winter; fish just about totally lacking in sporting qualities. However, because fishing was lawful everyone was after them trying to get their share while there were some left. Surely this is not good management! Surely a later season would do some real good by allowing the anglers to get some genuine sport in return for their investment in licenses and equipment.

Furthermore, the brooks cannot be expected to hold up unless there is some reduction in the creel limit. With a fishing intensity such as revealed by the initial "test-stream" investigation, a smaller daily catch certainly seems essential. No angler could object to a reduction from 25 fish to 15 fish. Fifteen fish are an ample reward for any day's fishing. Indeed, unless things improve they will be little short of a miraculous reward.

So much for Furnace Brook itself. No one can consider the results here without realizing that some sort of change in our trout-fishing set-up is imperative. A few suggestions have been made. It is just about impossible to keep fishing up to the desired standard with our present fishing regulations and with the present financial support given our hatcheries. The very first "test-stream" investigation has revealed some interesting facts. If nothing further is accomplished except to convince the agencies responsible for better trout fishing that they have a real problem to solve, then some real good has been done.

I believe however, that the "test stream" idea will accomplish more than this. Because it begins at the point where the ordinary stream survey program ends by providing the angling statistics with which

to back up biological findings, the "test stream" set-up will in the end discover things of vital importance to successful trout management everywhere. The importance of catch figures cannot be overemphasized. They are essential before we can check up on different stocking methods, different fishing regulations, and their effect on angling done under all sorts of conditions. When the "test-stream" method is expanded so as to show what really goes on in representative trout waters, then we can expect to know more what should be done to improve our stocking policies, our fishing regulations—in short, our trout management.

SUMMARY

1. A better understanding of today's trout-fishing situation is essential before adequate steps can be taken to improve it.

2. The 1935 Assembly of the State of Vermont passed a bill giving the fish and game service authority to cooperate with the Bureau of Fisheries in an investigation designed to determine the trout production of different waters.

3. The bill in essence states the "test waters", up to four in number, may be reserved at any one time for the purpose of securing angling statistics. Fishermen are required by law to report all fish taken therein. A permit, issued without charge, must be secured before fishing "test waters." The Bureau of Fisheries oversees the stocking, carries on the necessary scientific research, and the Vermont Fish and Game Service enforces the fishing regulations. Violators are liable to a $10 fine.

4. To date, one stream, Furnace Brook, has been used for the "test-stream" work.

5. For the fishing season, May 1, 1935, to August 14, 1935, inclusive, 1,197 angling reports were secured on Furnace Brook. The season's catch was 8,589 legal trout. Anglers averaged 7.2 trout per fishing attempt. Rainbows made up 34 percent of the catch (this species is maintaining itself without stocking). Brook trout made up 66 percent of the catch (the number of brook trout caught exceeded the number of fish planted before the first fishing month was over).

6. The experiment indicates that a later opening date for fishing in northern States would give the anglers better sport and better fish.

7. The experiment indicates that the present creel limit is too high when the fishing intensity is considered.

8. It is concluded that a "test-water" program offers a real opportunity to determine what the trout-fishing situation is like. It will help formulate better stocking policies and suggest better fishing regulations by ultimately revealing the relationship between the number of fish planted and the subsequent catch in different types of trout waters. This means in short—better trout management.

REFERENCES

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DISCUSSION

Dr. Hazard (Michigan). This is one of the most important papers. From my experience I believe we will never have satisfactory fishing conditions until we come back to the very first principle—restriction, regulation. We do not like it. But I think the average fisherman prefers a week of good fishing than to struggle along over 30 days and come home disgusted. Streams will have to be managed individually. We will have to determine the yield and then regulate the catch. Hunting seasons are much more restricted—they have the bag limit. We have got to get to the same point in fishery, at least throughout stream management.

Dr. Hubbs (Michigan). This contribution is important. There is no question that there is a great deal that can be learned of great value in such detailed account, getting an actual estimate of yield in a single body of water. We have in Michigan taken an estimate on individual lakes. It is important that we have a State-wide survey. We cannot know from 1 or a dozen or 20 streams what fish are all over the United States. This should be done by States over the entire United States. A survey of one stream will give us the yield of that stream, and will bear more or less on similar streams, but I do not believe that 5 percent of our lakes in Michigan have a yield as high as that throughout streams in the West. What we need is a general survey in every State of the yield, and then we need a thousand detailed surveys before we get to the bottom of the problem.

Mr. Hart (Virginia). We have a strong sentiment in Virginia that we should do away with the length limit and have a daily bag limit regardless of the size of fish caught. I would like suggestions from someone who has had experience along this line.

Mr. Hayford (New Jersey). I was very much interested in Dr. Lord's paper. In New Jersey it has been compulsory before obtaining a license, for a sportsman to tell the number of fish caught by him the previous year. It has been interesting to get the report and watch it go up and down. Very little variation. I assume that this report is fairly accurate.

Mr. Dave Roberts. It seems to me that these problems should be given national significance. It would be necessary to conduct nationally a series of experiments. For instance, in a territory in the Northeastern States we find different conditions from those in the Northwestern States. In the West, there are miles of streams and not so many fishermen, while in the East it is just the opposite. If we could arrive at some definite idea as to the average number of fish per man and average ability of the stream to produce per mile, we could then arrive at some figure to establish a bag limit. The western bag limit however, would not be good in the East.

Mr. R. W. Eschmeyer (Ann Arbor, Mich.). We use the Civilian Conservation Corps for this in Michigan. If we are going to do this work, this would be the time to do it.

Mr. Douglas (Nebraska). I wonder what is being done over the United States with reference to determining food value in certain streams and lakes. We have wasted thousands of dollars dumping

fish out with no analysis of the food value in that stream or lake. I wonder if there are any experiments being made along this line in a scientific way.

Dr. MOORE (New York). Some 12 States or more are conducting such surveys: Michigan; New York State; California, in conjunction with United States Bureau of Fisheries; New Jersey; Connecticut; Ohio; and a number of others. So we have a number of important leads to guide us in this problem.

Mr. J. A. RODD (Director of Fish Culture, Ottawa, Canada "Fish Management, Paul Lake, British Columbia"). I might say that this lake is typical of lakes in that section, and I have used it as an example of lakes in that territory.

Dr. HARKNESS (Toronto). I think that the paper shows very definitely that if we are going to establish the policy, we must have a creel census in order to know what we are going to do. It seems to me that the answer to this question is perhaps an educational program, through the press and other means, in putting before the fishing public the absolute necessity of the anglers giving us a return if they hope to continue the sport of angling. If we can get this publicity and then back it by legislation, we can establish a fish culture policy. But without a census we are at a loss.

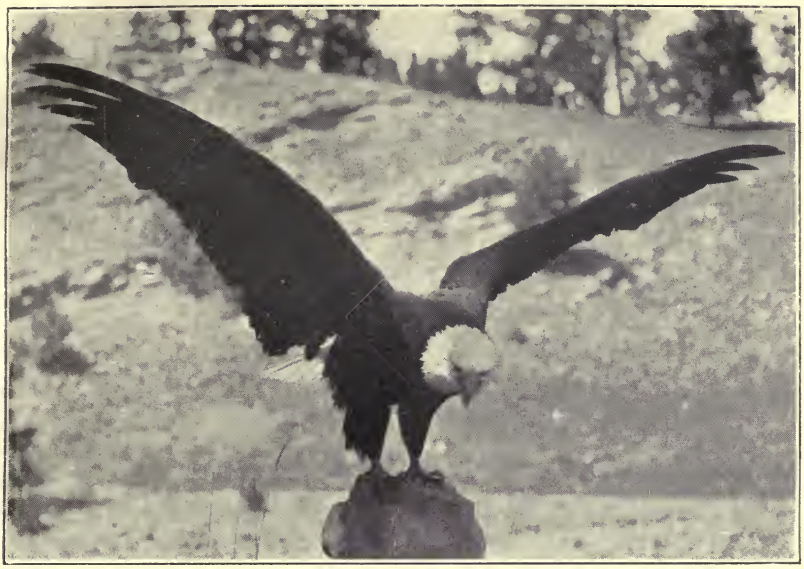
Mr. R. W. ESCHMEYER (Ann Arbor, Mich.). We in Michigan have not had trouble getting the information provided we write it down. If we have a man posted in spots along the stream he can get the information with no difficulty if he will write it down. The fisherman does not want to be bothered with writing it down, but does not object to giving the information. Those who object will bear watching. We have used Civilian Conservation Corps on this and so far it is satisfactory.

FISH MANAGEMENT, PAUL LAKE, BRITISH COLUMBIA

(By J. A. RODD, Ottawa, Canada)

Paul Lake, located at an altitude of 2,500 feet, near Kamloops, British Columbia, is fairly typical of the "dry belt" trout lakes of that Province. It is perhaps slightly deeper than most of them with an average depth of 100 feet and a maximum depth of 180 feet. It covers about 1,000 acres with from 7 to 8 miles of shore line. The outlet is screened to prevent the downstream migration of the fish into irrigation ditches. There is only one inflowing stream of importance which the trout use for spawning. The lake is reasonably well populated with a variety of fish-food organisms. The trout have an average growth of from 8 to 10 inches at the end of their second summer and fish of 5 pounds and upward are frequently taken.

Paul Lake contains a pure culture of Kamloops trout as it was barren of fish life until it was stocked with Kamloops trout in 1909. These fish did extremely well and as is usual in lakes of this nature a large and rapid growth took place following the first introductions. It, however, followed the usual trend when lakes of this nature are



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A, A bald eagle shows its wide wingspread. (Forest Service photo.)

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B, American golden eagle. (Forest Service photo.)

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Birch trees in the White Mountain National Forest, N. H.—a good source of buds for wildlife food.
(Forest Service photo.)

stocked, that is, the fish grew rapidly to a large size, but as the numbers increased the food supply diminished. Fishing decreased the numbers of trout and the food supply increased. As the food supply increased, the size of the trout also increased.

The spawning run of adult trout in Paul Lake probably reached its maximum about 1924. The food supply probably began to diminish in 1920. The average weight of the mature fish was about 4 pounds in 1922, 2 pounds in 1925, 2½ pounds in 1926, and 4 pounds in 1931.

Paul Lake has a particularly heavy fishing drain because it is conveniently located and reached by a good road. Considerable numbers of resident and nonresident anglers fish there each year. The fishermen who visit the district come from many parts. Fifty-eight percent of them are from other points of British Columbia, 16 percent from the United States, 12 percent from other parts of the British Empire, and 14 percent from other Canadian Provinces. People from many parts of the world passing through Canada take the opportunity of fishing in the Kamloops district and thus the fishery is an asset which the people are anxious to see developed efficiently.

A brief survey of the situation made in 1931 indicated that the total value of the fishing in Paul Lake to the people of the district in terms of additional money brought in was about $10,000 annually. The annual stocking or seeding of 200,000 fry at $3 per 1,000 amounts to $600. This is an annual return of nearly 1,700 percent on the investment.

Because of the location of the boat livery and the concentration of the cottages in a single area, an enumeration of the catch is easily made. An enumeration of the spawning run is also easy, as there is only one spawning stream of importance.

It was first stocked in 1909 and the run of spawning fish developed to such an extent that an egg-collecting station was established on Paul Creek, the principal inflowing tributary, in 1922. A preliminary study of the biological situation in the lake was made in 1931. The quality and quantity of the food supply were determined and other information was gathered. From this material an investigation was outlined as follows:

1. To set a definite annual planting or distribution of fry and to maintain this quota for 4 or 5 years. The size of the distribution was placed at 200,000 fry or approximately 200 fry per acre.

2. It was also decided to make an annual determination of the yield of the fish by counting the number of spawners and the number taken by fishermen.

3. At the same time a careful watch was to be kept for fluctuations in the rate of growth of the fish, that is, size for age and for variations in the productive capacity of the lake.

4. If the annual planting of 200,000 fry in Paul Lake after several years resulted in an increase or decrease in the food supply, then the number of fry could be judged and eventually a proper balance could be reached.

The upstream or spawning migration into Paul Creek was counted in 1935 and a census was taken of the catch of anglers. The up-

stream (counted) migration was 2,268 fish. The total spawning component of the lake for the past 4 years was—

	Trout
1932	500
1933	900
1934	1,450
1935	2,300

The total catch during 1935 amounted to 11,500 fish. The production of trout for the year was, therefore, about 11 fish per acre, which is the highest catch yet recorded.

The average catch per boat per day for the 6 months of the fishing season is as follows:

May	12.7
June	10.1
July	7.4
August	6.6
September	10.2
October	11.9

The weighted average catch per boat per day for the whole season was 10.3. This value has been rising steadily since the intensive stocking program of 200 fry per acre was adopted in 1931.

The weighted average catch per boat per day for the past 4 years was—

1932	4.10
1933	5.91
1934	7.54
1935	10.3

The fishing effort in 1935 was greater than it was in former years, being 838 boat days.

The values in boat days for the past 4 years were—

1932	486
1933	736
1934	746
1935	838

The increases in fishing effort, spawning component, and average boat catch per day from 1932 to 1935 were—

Fishing effort in boat days:	
1932	486
1935	838
Percentage increase	172
Spawning component:	
1932	500
1935	2,300
Percentage increase	460
Average catch per boat per day:	
1932	4.10
1935	10.3
Percentage increase	251

During these 4 years, 1932 to 1935, inclusive, fry, equal in numbers to about 43 percent of all the eggs collected there, were returned to Paul Lake and the balance, or nearly 60 percent, was used to stock other waters.

Observations made during the past season of 1935 suggest that the annual seeding of the lake with 200,000 fry is a little heavier than is necessary and might be decreased.

Fostering Cooperative Fish Rearing

(By G. C. Leach, Chief, Division of Fish Culture, U. S. Bureau of Fisheries)

This appears to be an opportune time to present before this conference the achievements that have been accomplished through cooperation with States and also fish and game organizations in rearing small fish to larger size before releasing them.

During 1929–30 a movement was started among the fish and game clubs to cooperate with the Bureau of Fisheries in rearing to a larger size the small fish usually released by the hatcheries. The Bureau and several States fostered the plan with the result that in 2 years' time there were approximately 300 rearing-pond units scattered throughout the country. The anglers were quick to realize that better results would be obtained if the small 1- and 1½-inch fish, usually released earlier in the spring, could be held in the ponds where they would be fed and cared for during the summer months and then released during September or October at which time they are from 4 to 5 inches in length.

The Bureau of Fisheries became interested in the proposition and made investigations of the proposed sites where the ponds were to be constructed. A suitable supply of fish was assigned to the clubs and frequent inspections were made during the summer months for the purpose of advising with regard to the methods used in feeding and caring for the young fish. Several of the States went so far as to construct rearing ponds and supply the fish and the fish food with the understanding that the organization would be responsible for the caretaker.

The rearing ponds were operated until the financial situation made it necessary for many of the sportsmen to curtail their budgets. A number of these projects are still in existence, and the anglers are unanimous in proclaiming the benefits to be derived from fish rearing under such a plan. They are apparently well convinced that the releasing of fish from 4 to 5 inches in length is productive of better fishing.

In most of the Eastern and Middle Western States conditions have materially changed in the past 15 or 20 years with respect to fish production under natural conditions. The cultivation of land, the destruction of trees, and soil erosion, have changed the condition of many streams and lakes that once abounded in fish life. It is therefore apparent to all conservationists, especially those interested in fish, that if results are to be obtained it is necessary to produce fish of a larger size, since the once abundant supply of natural food for the small fish does not exist.

During the present stress of financial conditions many clubs throughout the country have taken advantage of the offer of Public Works money and have been successful in securing funds for the construction of fish-rearing ponds. This is especially true with regard to the Izaak Walton League chapter at Argos, Ind., where several acres have been placed under water for the production of small-mouth bass for the Tippecanoe River, one of the ideal small-mouth bass streams in this country.

Other important achievements in the rearing of the small fish under cooperative plans have been noted. In New York the Malone Fish and Game Club has been very successful in its efforts to rear trout; also, the Utica Chapter of the Izaak Walton League in its operations at Barneveld, N. Y. Credit is also to be given to the Monroe County Park Commission at Rochester, N. Y. This organization became interested in what had been done and they not only established fish ponds but constructed a hatchery and fully equipped it for the purpose of producing fish for local waters.

In the State of Pennsylvania, the Texas and Block House Club at Williamsport has been very successful in its fish-rearing project, also the Windber Sportsmen Association and several other organizations in this State.

The various States in which clubs are taking real interest in the work of rearing fish and distributing them are too numerous to mention at this time. It is the opinion of the Bureau that aside from the results obtained by the anglers there is another side to the story. When an organization constructs ponds, feeds and cares for fish, and then carefully releases them in some suitable water, the members of the club are going to follow up this interest by seeing that the fish are properly protected. Further than this the public also takes a very keen interest in such matters and wherever fish have been reared by organizations, the public has availed itself of the opportunity to visit the rearing ponds in large numbers. It gives them a practical lesson in conservation work. It indicates to them that the small fish may be successfully reared and that streams may be stocked with the results so that good catches of fish can be made later on. Not only this, but in practically every community where the fish are being reared under such conditions, the public schools make frequent visits to the rearing ponds for the purpose of studying fish life. The interest that is manifested by the schools is of great importance to this country if conservation measures are to be given careful consideration in the future. These benefits are far more important than the mere stocking of the waters for the production of better fishing. The interest taken by the youth of the country in such matters is of even greater value. We must educate the coming generations with regard to the value of conservation work in order that the future supply of fish may not be depleted and that they in turn may pass on a heritage equal to, or better than, that which they have received.

DISCUSSION

Mr. Leach. It seems to me that it is going to have to be done through the public schools. Numbers of States have gone so far as to take moving pictures and show them in schools, in the way of making improvements to streams, rearing fish, etc. There will have to be a study of stream conditions, know what kind of natural food there is, and produce that food. We would not think of going out here and throwing a fence around any old lot and putting cattle in there and expect the cattle to survive. We must also figure out fish food and then depend upon the public to protect the fish until they have reached sufficient size. Fish should be reared to legal size.

In our Western States we are still groping around in regard to food conditions. We should follow what New Jersey has been doing.

Mr. CARBINGER (Minnesota). In Minnesota we have had very good cooperation with the Bureau of Fisheries. We have 55 ponds. Since 1927 we have raised to finger-length size, between 4 and 10 inches, over 1,000,000 bass. A great many smaller ponds have been started by the Bureau of Fisheries. They have been a great success. These ponds are a wonderful asset and help in building up fish population.

P. D. ALDRICH (Oklahoma). Some years ago when the Bureau started this program, Oklahoma took up the problem in a big way. At the present time fish cultural ponds in connection with new lakes or waters are very important. No program is complete without it. There are a large number of cooperative ponds in Oklahoma. They are proud of that program. In regard to the educational side the percentage of sportsmen has increased by bounds since municipal hatchery. Each school is equipped with an aquarium, and fish propagation and fish conservation is taught in the schools. Our ponds are owned and operated by the city water department in connection with city reservoirs, and operate as an adjunct of the Government. The public in general consider the fish hatchery a necessary part of the Government. Fish are planted in municipal waters. We have 33 ponds. We allow fishing in three of them. In one we charge 25 cents per day to fish out of the 2,000-acre reservoir. There are two other reservoirs further out on which there is no charge to fish. The idea is to stimulate interest in fishing. There are very strict regulations and size limit. People do not object to restrictions. Regulations make a drawing card. We have very little trouble with poachers. All reservoirs are under the city water works. We also have 6 or 8 smaller lagoons scattered through town, under supervision of park department. No charge on these for fishing. People can fish when they want to. In regard to fishing in reservoirs sanitary restrictions are stringent. All equipment is inspected. A gong is sounded and all fishermen must come off the water at dark.

IOWA FISH MANAGEMENT PLAN

(By Fred Schwab, chief, fish and game division, Iowa)

To successfully manage fish in any State, a plan is of first importance. Of second moment is a recognition and knowledge of field conditions including both physical and biological factors with an appreciation of the practical and scientific phases of fisheries work.

Wide variants of fish ecology are exhibited in Iowa. A classification of the State waters reveals a gamut of gradations in stream and lake characters, cold trout waters of northeast Iowa, rock-bottomed bass rivers of the upper mid-State, and warm turbid catfish streams of the southwest. The lakes range from shallow bullhead areas, pan fish and bass sections, to the sport fishing, pelagic Okoboji, each body of water demanding individual treatment in stocking, in improvement, and in management.

These natural sequences establish a variety of propagation problems. Iowa fish culturists care for troughs of brook and rainbow trout, batteries of yellow pike-perch, raceways of artificially fed

small-mouth bass, and pond units of bullhead, bluegill, crappie, and large-mouth bass, each group of fish requiring different methods of daily care and study.

The various types of fishing areas, with their specific biotic factors, an increase in fishing interest, the lake building and restoration impetus of the 25-year conservation plan, the probability of a diminishing supply of stock from the canalized Mississippi, the lower water levels in the State, the correlation of fisheries improvement with waterfowl management all coupled with limited faunal and ecological history necessitate the placing of a fish management plan on a fundamental basis.

For these reasons the basic factors in such a plan as are here enumerated are fused into a working plan that is practical, scientific, and therefore reasonable.

Propagation.—The propagation of fish includes trout and pike-perch hatcheries, pan fish, bullhead, bass, and forage minnow ponds; nursery lakes that are certain small lakes where fry are introluced and fingerling periodically removed to regular fishing areas; sportsmen's ponds where local groups under State supervision produce fish for local waters.

Collection.—The collection of game fish from land-locked ponds in the flood plains of inland and border streams and their return to suitable fishing waters.

Rescue.—The wholesale rescue of fish by Federal, State, and sportsmen's groups from land-locked pools in flooded districts and their return to mother waters or their use for stocking barren waters.

Stocking.—The stocking by State and United States Bureau of Fisheries of State-owned lakes and privately owned areas, the stocking of rivers, smaller streams, and reservoirs.

Obnoxious fish control.—The removal of carp, gar, dogfish, and other rough fish from game fish waters, by department crews, by contract, by relief labor under a State-wide W. P. A. project, by gill netting through the ice, and by sportsmen's groups.

Winter aeration.—The mechanical and natural oxygenation of the shallow lakes that experience unusual oxygen depletion during the winter months. The work is pursued by the department, by W. P. A. projects, and by sportsmen.

Improvement.—Streams; major activities are erosion control and reforestation of watersheds; tree planting of stream banks; the elimination of pollution directed by the State board of health; the installation of devices and dams by State, Federal Government, and sportsmen's groups. Lakes; the reconditioning of natural lakes by restoring natural shore lines by excluding cattle and all agricultural practices from the immediate lake area; the introduction of suitable aquatic vegetation; the stabilization of levels by controlled inlets and outlets, the control of rough fish; planned stocking correlated with creel limits; and a dredging program of distinctive proportions. Artificial lakes; the building of fishing lakes. Lake Wapello, a typical example of fish management, with its lake bed prepared with fish shelters of rock and brush, and spawning areas of tile, gravel, and sand, aquatic vegetation plantings for fish and waterfowl, scheduled stocking and service facilities provided for the recreator. City and leased reservoirs; an improvement program outlined for municipal execution that approximates artificial lake development.

Acquisition.—The securing of trespass waivers along privately owned streams, access agreement for public use of deserted railroad reservoirs; the purchase of riparian rights along State lakes and the acquisition of areas suitable for pond propagation units.

Surveys.—Physical surveys by engineers of lake-bed contours, and watershed topos, including geological data and wind and precipitation phenomena; biological surveys of aquatic fauna, including records of biotic and chemical conditions, creel census of water stocked and the reconnaissance of streams and lakes for future improvement.

Biological.—The initiation of fundamental ecological studies with emphasis on fish distribution and controlling increments, the correlation of private and State scientific research work with pertinent fish problems, and the dissemination of information to fish and game workers that are not scientifically trained.

Administration.—The field execution of the program, the budgeting of funds, the care and purchase of equipment, the establishment of a record system to preserve field history, and all such duties that apply to execution of plans. Each section of the plan dovetails into each other to make a composite whole. Each phase of this plan is formulated in detail. All employees working in each particular section are apprised of the tentative plans made for their division. They are then asked for their criticism and suggestion.

This method gives each fisheries worker a clear idea of the ultimate goal in view and tends to stimulate self-interest, by giving each worker a picture of his part in the general plan. Fisheries progress cannot be made unless the fisheries worker adds to and uses to the best advantage the knowledge he possesses. To insure the consummation of this fisheries program, the unstinted cooperation and whole-hearted interest of all employees are necessary.

If proper cognizance is taken of all factors herein set out and prudent attention paid to the attendant details, aquatic resources will be reestablished on a plane that will aproach a natural optimum.

DISCUSSION

Mr. Schwob. In the State of Iowa we handle reservoirs on a little different plan. We get permission to go in and make the necessary improvements on them.

I think we should have some kind of fish management plan, the same as game management. We all know that each lake or stream is capable of producing so many legal catchable fish. If all foodstuff is removed, fish will diminish. We need regulations. We try to keep rough fish out of our lake. Hope there are no carp in it. But if we allow fishermen to bring minnows, we will be stocked with carp. I would like to talk this over with any of you who have the same problem.

Mr. J. A. Rodd (Canada). What method have you followed to aerate lakes?

Mr. Schwob. We have been using a different type of pump. We are right now carrying on some tests, and do not know yet whether we are aerating lakes or pumping water.

Glenn C. Leach (Washington, D. C.). The Bureau is very much interested in your proposition in Iowa. We feel that Iowa is one of the progressive States in the Midwest. Especially the manage-

ment and plan laid out and the work being done in cooperation with the Bureau. We have been getting along nicely in our operations out there. All the Midwest has the problem of the carp situation. If States will try to raise larger fish, young carp will serve as food. You have to produce large fish first.

As to aeration, natural conditions will take care of this.

Mr. J. A. Rodd (Canada). We are coming to the same conclusion that we should stock larger fish first. We have discussed stocking of finger length fish (trout). Stocking legal size trout. We have very little natural reproduction, and food conditions are not good. Cannot be, because of heavy run-off of waters—hilly country—causes floods and deletes streams. Even trout are killed with rolling rocks. We are stocking nothing this year but legal size trout. We are very much interested in those natural rearing ponds. Have they been a success?

Mr. Schwob. We have had only one trout rearing pond—a cooperative arrangement with the owner of the pond. It has proven very successful. We are trying another this year—it is just being developed now.

Mr. Rodd. How about the oxygen exhaustion?

Mr. Schwob. I might explain that these trout rearing ponds are spring fed and this cold spring water is, of course, ideal trout water.

Mr. Rodd. Of course, there is the matter of vegetation dying down to where it does not cause oxygen.

As to the matter of production of large fish. What about the cost? Of course, the result is based on how many we get of legal size on the cost per thousand.

Glenn C. Leach. We have kept a very close cost account, but will have to prepare and hand the figures to you. It varies.

Sportsmen are willing, as has been shown, to cooperate with us on legal size fish. The only thing to do is to raise fish to legal size. You have to introduce 5- or 6-inch bass if you are going to combat carp. You have to introduce fish large enough to take care of carp.

Essential Considerations for Fish Management in Lakes

(By R. W. Eschmeyer, Institute for Fisheries Research, Michigan Department of Conservation and the University of Michigan)

INTRODUCTION

A study of the history of the several phases of fish management suggests a rather one-sided development. In artificial propagation and stocking, the emphasis has been on more and cheaper production. The effectiveness of stocking and the planting of fish in suitable waters has received relatively little attention. The benefits which may have been derived from our fish propagation units have never been adequately determined. Fish legislation has not always been sound and the results desired from legislation have not always been forthcoming. Introduction of exotic species has done good and has done harm. It is easier to plant fish, to make laws and to introduce exotic species than it is to determine whether these activities

are sound conservation. Likewise, in connection with environmental improvement, the most recent factor in fish management, it is easier to install an "improvement" than to determine whether that "improvement" is beneficial or injurious.

The biologist, cognizant of the lack of a scientific basis for much of the fisheries work, has bombarded the practical fisheries worker with a variety of words: Inventory, rate of growth, environmental improvement, maximum utility, chemical analysis, hypolimnion, vegetation studies, food studies, sun spots, subspecies, and the coefficient of condition. It is not to be wondered at that the practical fisheries worker, after listening to the multitude of large words, has gone back to his study on a comparison between the relative merits of sheep plucks and liver as food for trout.

The degree to which the various phases of fish management will eventually depend on an understanding and application of scientific

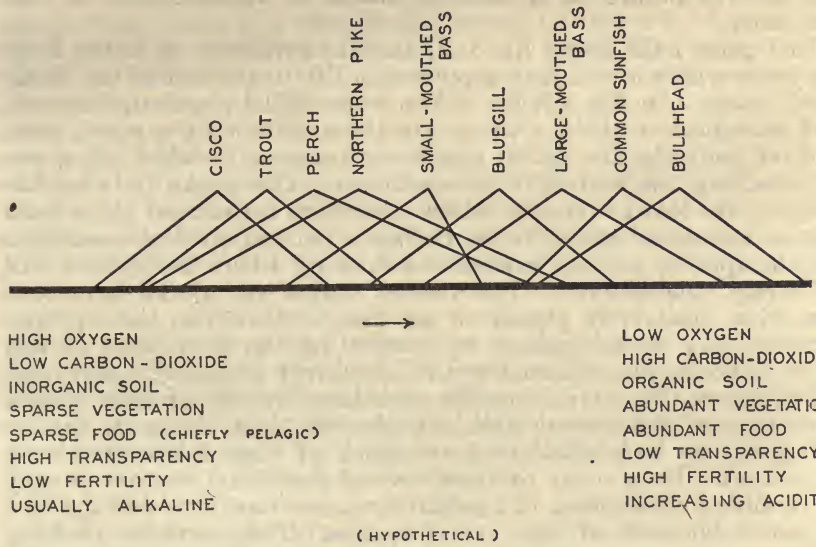

FIGURE 1.—Evolution of Michigan glacial lakes with reference to suitability for several species of fish.

information depends, to a considerable extent, on the degree to which the fisheries biologist can organize his field and can point out the practical application which may be made of his studies. The purpose of this paper is not so much to suggest certain essentials for fish management as to indicate how some of these essentials may be coordinated and how their study may lead to practical application. Three essentials: Inventory, creel census, and studies in rate of growth will be briefly discussed.

During the summers of 1930, 1931, and 1932 the lake investigation party of the Institute for Fisheries Research under the general direction of Dr. Carl L. Hubbs and under the writer's immediate supervision made a chemical, physical and biological inventory of approximately 150 Michigan lakes. This inventory provided con-

siderable information of immediate value but any attempts at classification and coordination of data were not immediately successful. The lakes would not fit into any well-organized scheme of classification. Yet, if Michigan's four or five thousand lakes were to be inventoried the development of a system of classification and of "short-cut" methods of inventory were imperative. Eventually, a recognition of the facts that the lakes are in various stages of their evolution; that in this normal evolution gradual and relatively uniform changes in the biological, chemical and physical properties are taking place, though not at a uniform rate; and that this continuous variation cannot well be expressed by placing the lakes in a series of definite and well defined classes, lead to an organization of the material which made possible a better understanding of some of the problems of fish management. Although the data have not yet been fully prepared and certain definite changes obviously will need to be made, the general nature of a suitable means of classification is here presented.

In Figure 1 the heavy line indicates the evolution of a lake from the stage where it will first support fish life to the end of the "bullhead" stage. On the left are shown some of the physical, chemical, and biological conditions which are characteristic of a young lake, and on the right are shown conditions common to lakes which are approaching the end of their evolution. The peaks indicate the range in the lake's evolution where conditions for each of the several species mentioned are suitable, the apex indicating ideal conditions for the species, and the extremities showing where the species will be barely able to exist. The various ranges and peaks have been somewhat arbitrarily placed on the chart. However, their proper location may be ascertained by correlating the abundance of fish of each species (as indicated by the inventory) in the lakes surveyed. Furthermore, by correlating the abundance of fish of each species with each of the several chemical, physical, and biological factors listed, it may be possible to show which of these factors are most significant. By a study of these several significant factors, it may be possible to determine, in a relatively short time, how well the lake is suited for each of the several species. There will be limiting factors which are not indicated in the figure. In a very deep lake the shoal may have approached the "bullhead" stage, and the strata in the vicinity of the thermocline may still be suitable for cisco; a lake which has approached the end of its evolution may still be suitable for fish characteristic of relatively young lakes if a cold stream enters the lake; size of lake appears to effect the nature of the population; competition between species is definitely a deciding factor.

The rate of change will depend on altitude, latitude, richness of soil in the immediate vicinity, on the original depth of the lake, on the rate of deposition of marl, and on other factors. The evolution of a shallow lake in a rich agricultural area may progress very rapidly while, in a lake in high mountainous country, the changes may be very slow. A shallow lake having rapid deposition of marl may become unsuited for fish life because of extreme shallowness before having progressed very far in its evolution; it may die prematurely. Other lakes may eventually become acid bogs.

As the development progresses conditions become more suitable for some species and less suitable for others. The conditions as they exist, at various stages, meet the requirements of certain fishes but not of others. This may be indicated by a brief discussion of some habits of several of the fishes.

The cisco is an open-water fish which lives chiefly on the minute animal and plant life. It spawns over shallow water, the eggs dropping on the bottom. In a new lake the first food to form in abundance is plankton. Conditions are not yet suitable for bottom-feeding fish or for predator species. Bottom conditions might not yet be suitable for a fish with highly specialized spawning needs. There is little or no vegetation or other protection. Consequently, an open-water form, living on plankton and with relatively unspecialized spawning needs, can live in the water provided other factors, such as suitable temperature, are satisfactory. The needs of the lake trout are in many respects similar to those of the cisco, except that it lives to a considerable extent on larger food, with the cisco probably serving as the chief food item. The other trouts spawn in inlets or outlets in gravel; gravel is usually present in streams entering relatively new lakes. Perch, the next fish in the series, have a wide range of tolerance. They are intermediate between the cold-water and warm-water fishes. They eat a variety of food and drop their spawn in shallow water where it adheres to deadheads, vegetation, or other objects present on the shoal. The northern pike likewise has a wide range of tolerance, and, like the perch, is intermediate between the cold-water and warm-water fishes. It spawns in marshy outlets of streams or in marshy bays. By the time the lake has reached the "northern pike" stage it is old enough to have developed vegetation at the margin of the bays, and especially at the mouth of the inlets which have by that time accumulated considerable nutritive material. The pike is decidedly predatory and primarily pisciverous. By the pike stage, cisco, perch, or suckers will usually have become abundant. Any or all of the three species are suitable food for the pike.

The small-mouthed bass, in selecting its spawning site, shows a decided preference for gravel. By the "small-mouthed bass" stage sufficient gravel will usually have been washed on the shoal by wave action to satisfy its needs. Bluegills, large-mouthed bass, and sunfish will use gravel but can apparently also spawn quite successfully on the roots of vegetation. By the time the lake has reached suitable stages for these fish the shoal is usually covered with organic soil and vegetation is generally abundant. The gravel will tend to be covered, making imperative the use of something other than gravel for spawning. The bullhead can spawn suitably in lakes with organic bottom. Space does not permit a detailed discussion of a comparison of the evolutionary trend and the needs of the fishes. Those who have studied a variety of glacial lakes will recognize immediately many more possible comparisons.

A few further brief statements regarding the trend are made:

1. *Oxygen.*—In general oxygen decreases as a lake gets older and, in general, the fish farther down the scale require less oxygen. The reason for oxygen decrease is obviously due to an increasing amount of decay.

2. *Soil.*—The nature of the soil becomes increasingly organic. Old lakes almost invariably have a thick layer of organic peat covering the original bottom.

3. *Vegetation.*—There appears to be a more or less general change in the kind of vegetation, with a tendency for the total amount to increase during most of the lake's development.

4. *Fertility.*—Naturally, the fertility tends to increase during most of the development. A "young" lake is relatively unproductive.

5. *Fish production.*—The potential production of fish probably increases during most of the development. The total value of the fish may, however, be greater in a younger lake than in an older one because of the differences in size, taste, or some other characteristic.

6. *Food.*—The total food probably gradually increases during most of the development. Forage fishes could be arranged on the graph along with the fishes mentioned. A fish such as the Great Lakes shiner (in Michigan) would probably have a range on the scale similar to that of the cisco; the mud-minnow would be even below the "bullhead" stage. The range of other food organisms would probably also fit into the chart.

7. *Parasites.*—A study of the distribution of parasites might indicate a correlation between the kind and degree of parasitism and the degree of the lake's suitability for any species.

8. *Resort value.*—There appears to be an inverse correlation between resort value and capacity for fish production. A young lake with sandy, weedless shoals and clear water is excellent for boating and bathing, but relatively unproductive of fish; in an older lake the reverse is true.

The method of classification used not only permits coordination of some of the studies and visualization in the field of lake management but it offers immediate assistance in stocking. When the stage of the lake's development has been determined, a line drawn vertically through the graph at that stage will indicate how well it is suited for each of the several species which are propagated. It should help to indicate which species might well be encouraged or be introduced.

A recognition of the stages of development of the lakes should be of great value in lake improvement. The chief problem in a "young" lake is one of fertility and any considerable degree of increase in production must probably be dependent on an enrichment of the water. The planting of vegetation would probably be unsuccessful. Since the fish suited to a "young" lake are largely open-water fish, the installation of brush shelters would be of little benefit because these fishes use them very little. A few species such as the rock bass might be encouraged by installing shelters. With limited food and in water poorly suited for them, they would probably grow slowly and remain stunted, competing with the more desirable fish and being of little or no value for fishing because of slow growth and small size. While improvement in a "young" lake consists primarily of advancing the evolution, improvement in an "old" lake consists primarily of retarding it. Improvement in an "old" lake would involve the removing of vegetation, preventing winter killing (increasing oxygen), and increasing the number of fish. In a "young" lake the balance between fish and food favors the former,

in an "old" lake it favors the latter. In intermediate lakes the improvements, to be effective, must be installed with a recognition of their possible effect on the fish and with a recognition of the natural needs of the species in question. At a point where a lake is equally suited for perch and small-mouthed bass, the latter can be encouraged by providing gravel for spawning and shelter for the young fish. Experimentation suggests that perch use the shelters very little while bass use them to a considerable extent. The shelters not only help provide food for the young bass by concentrating insects and other organisms, but protect them from the predators. In this connection it might be pointed out that the species probably become progressively less active in winter; the pike are apparently more active in winter than are the bass, bluegills, and sunfish and therefore may be better able to prey on them at that season than at other times.

A knowledge of the needs of the species is essential to intelligent improvement work, and an inventory and classification of the lakes is essential in determining the immediate needs of the fish.

CREEL CENSUS

The Michigan Department of Conservation has conducted, since 1927, a general census on lakes and streams of the State. The census was primarily taken by the conservation officers. This sampling of the fishing throughout the state over a period of years provides considerable information of help to fish management.

Through the combined efforts of the Michigan Emergency Conservation Work and the Institute for Fisheries Research an intensive census was begun on several lakes late in 1934. The census was taken by crews of especially selected enrollees from a number of C. C. C. camps. In general the crews were large enough to check the returns of almost all fishermen on the lakes where the census was taken. During the last fishing season, crews were present on nine Michigan lakes and were contacting the fishermen as they reached the shore. At present a winter census is being taken on a number of our lakes. Figure 2 shows the census blank which is now used.

A detailed discussion of the census cannot be given here (the census on one lake was reported on at the last meeting of the American Fisheries Society). A few of the ways in which the census may be helpful in fisheries management are here listed. The intensive census, as taken in Michigan, provides means of determining for the lake: The amount of the annual crop, the catch per hour, the abundance in the catch of each species at each season, the effectiveness of the various fishing methods and of various baits, the residence of the anglers, the number of undersized fish caught (which helps to predict the fishing trend for the next year or two), the time of day when fishing is best, the relationship between weather conditions and fish "biting", the size distribution of the fish caught, and the seasonal fluctuation of each species in the catch.

Over a period of years the census will tend to indicate the maximum annual catch which may be taken without injury to future fishing. Coupled with an extensive marking program, it will help

indicate the total population of adult fish and the percentage of these fish removed annually. Coupled with stocking and marking, the census can, in time, provide data sufficient to evaluate the benefits derived from stocking. Coupled with lake improvement, it can similarly be made to indicate, in time, the effectiveness of lake improvement work in general, and of devices of different sorts. The census, taken on lakes at different evolutionary stages, will tend to indicate the production from lakes at these stages. It will show, in time, the effect of one species on another. If carried out on a number of representative lakes, it will help to determine approximately the combined annual fish catch for all lakes in the State. It will test the effectiveness of existing legislation and will help to indicate what restrictions would be of greatest benefit to the lake and least objectionable to the fisherman.

CREEL CENSUS—Michigan Department of Conservation

Lake or Stream..... Fisherman's Name.....
Township..... City or Town.....
County..... Sex?..... Approximate Age?.....

SPECIES CAUGHT	LEGAL SIZE		UNDERSIZE	
	Number	Av. Lgth.	Number	Av. Lgth.
Brook Trout				
Rainbow Trout				
Brown Trout				
Large Mouth Bass				
Small Mouth Bass				
Bluegills				
Sunfish				
Yellow Perch				
Pike Perch (Walleyes)				
Northern (Grass) Pike				

(Enter other kinds taken on blank spaces above)

Date..... 193....

Kind of Fishing:

Ice?..... Still Fishing?.....
Boat?..... Trolling?.....
Shore?..... Casting?.....
No. of persons?..... Total No. of lines?.....
Bait (Check if only one kind of bait used)
How many fish caught with worms?.....
Insects?..... Minnows?..... Spinner?.....
Plug?..... Artificial Fly?.....
If taken with other bait, or by spear, dipnet or other means, state how.....
Weather: Clear?..... Heavy Wind?..... Cold?.....
(Check) Cloudy?..... Light Wind?..... Mild?.....
Rain?..... Calm?..... Warm?.....

TIME FISHED ..... HRS.
A.M. ▼ 12 1 2 3 4 5 6 7 8 9 10 11 12
P.M. ▲

Draw line through hours and quarter hours fished; double line through indicated time when fishing was best. Make out report whether fish are caught or not.

FIGURE 2.—Blank used for the Michigan Creel Census

The benefits to be derived from the census are obviously many, and the Michigan Emergency Conservation Work, in cooperating so extensively in this work in a number of camps, has made an outstanding contribution to fisheries management.

RATE OF GROWTH

A number of studies have been made on the rate of growth of various species. These studies have not generally lead to any alteration of the stocking programs. When the average rate of growth of the propagated species has been determined for various types of lakes in different areas and when, by inventory (aided by creel census studies), it has been determined which of these species are most suited for the lakes, an examination of the growth rate of a small number of fish would be of decided help in determining the stocking program. This may best be illustrated by comparison with directing

the operation of a farm from an office or sickbed. The owner knows, from previous study, that he has the right kind of livestock for his pasture. He has a small representative number of them taken to him for examination and, by examining them, he can immediately decide whether or not the herd should be increased. If the cattle are in excellent condition, he may safely conclude that the pasture will hold a few more head; if the specimens are average, he will probably let well enough alone; if they are in very poor condition, he would certainly not add more to the herd—he would probably reduce the number of cattle or improve food conditions.

Since the rate of growth of fishes is dependent, within limits, on the amount of food available for the fish, stocking intensity may be determined on the basis of growth without an intensive study of the food or of the concentration of fish in the lake. Based on a periodic study of fishing intensity and on a continuous study of growth, stocking may eventually be placed on a scientific foundation.

Should a relatively large number of scientifically trained men work on the problems which were here briefly mentioned (and on associated problems), it appears possible that eventually, in lake management, there may be a considerable curtailment of that one item which has been so characteristic of conservation work in the past, viz, guesswork.

DISCUSSION

Dr. J. R. Greely (New York). In relation to the surveys of the lakes in New York, I think the classification is helpful. Classification on predominant trend of fish population. In New York we have a combination of circumstances. Where you have trout and whitefish but not perch or bass, we have northern pike. Since those fish have been put in they have taken advantage and have driven out the other fish. It is pretty much a matter of which gets there first and gets the jump on the others.

Another point of importance is the overstocking of certain lakes. In New York surveys have not been carried on at all, and in a great many instances the lakes are crowded up with quickly multiplying fish.

Fish Management

(By Emmaline Moore, chief aquatic biologist, New York State Conservation Department)

Fish management may be defined as maintenance at full capacity of a sustained yield.

To obtain yields up to this limit one must know what the potentialities of production are for each body of water, and to apply such regulatory and improvement measures as will sustain the yield. It implies the maintenance and adjustment of both game fish and forage elements in suitable balance.

In the appraisal of waters leading to effective fish mnagement, certain essential steps may be outlined. For convenient discussion, they may be considered under two main subheads:

A. *Basic investigations.*—(1) Those dealing with questions of productivity; (2) fish population studies.

B. *Management developments.*—(1) Stocking of fish, (2) fish protection, (3) environmental improvement.

BASIC INVESTIGATIONS

1. *Investigations dealing with productivity.*—The importance of the investigation of environmental conditions is recognized in the fact that our fisheries resources maintain themselves entirely and are, therefore, dependent only upon environmental conditions. Important environmental factors influencing production requiring investigation are:

(*a*) Water analysis to determine the relationship between such chemical factors as alkalinity, dissolved oxygen, free carbon dioxide, and pH, which have a direct bearing on productivity.

(*b*) Food supply investigations to determine the quantitative and qualitative abundance that serve as direct or indirect sources of food.

(*c*) Plankton studies to know to what extent this elemental food is being utilized by the fish. It is the natural food of all young fish and forms a part of the dietary of many adult fish.

(*d*) The aquatic vegetation is an important subject of investigation because the plants of the water form a part of the cycle that builds up a supply of food for fish and other animal life. A very simple chain of food relations, for example, is seen in the food of lake trout. Its immediate food may be the cisco which in turn feeds chiefly on a minute plant, a diatom, deriving its sustenance directly from the soluble inorganic substances and gases in the water. In the food chain of the golden shiner, weeds may be consumed directly by the fish.

2. *Fish population studies.*—Knowledge of the kinds of fish present is basic to an improved management of fish resources. An extension of this information will deal with their ecological relationships, favoring increase or decrease, including studies of competitors, predators, forage aspects, the presence of disease, the environmental requirements of temperature, shelter, and spawning grounds; also, life history studies, growth rate, and migration. Furthermore, depletion due to angling is a very important consideration because of the ascendency of species which, not being angled for, are increasingly protected.

MANAGEMENT DEVELOPMENTS

1. *Stocking of fish.*—In management practices the distribution of fish raised in the hatcheries has been relied upon to a large extent to maintain the stock. Increasingly it is becoming evident that the stocking of fish is a complex undertaking because each species to be stocked has certain physical, chemical, and biological requirements which must be considered if it is to succeed.

There are "don'ts" in the category of stocking which may be briefly considered. There should be avoidance of undesirable additions or of too many predacious species in one body of water. In the past it has been too often the practice to introduce a new species of game fish in order "to improve conditions." On this assumption (without basis of fact) some good fishing waters have been ruined through the introduction of the wrong species. To cite examples, lake trout or bass waters have suffered by the introduction of pike-perch. Introductions of bass or perch into trout water have been know to completely change the composition of the natural trout

305474

Lookout tower on Hopkins Mountain in Monongahela National Forest, W. Va.—fire prevention is wildlife insurance. (Forest Service photo.)

293449

A, Chinese pheasant in a field near Portland, Oreg. (Forest Service photo.)

226606

B, Virgin longleaf pine in Choctawhatchee National Forest, Fla.—when the undergrowth is not too dense such lands are good for quail. (Forest Service photo.)

population, resulting in the extinction of the native trout. Disastrous effects have followed the introduction of too many predacious species in a body of water, causing an upset because the number and kind of species are not balanced to the available food supply.

In stocking, considerable emphasis is now placed upon planting large-sized trout, particularly in waters that are heavily fished. It may be advantageous under certain conditions to plant large sizes in waters inhabited by predacious species where it is expected a minimum of predation would occur. This policy, however, has to be considered on the merits of the water.

2. *Fish protection.*—Except for the stocking that is carried on, and these include but relatively few species, management has based its hopes largely on the regulation of size, season, and catch limits. Despite the emphasis upon regulatory measures there is growing depletion. Regulations are largely imposed by legislative enactment and are generally State-wide. In some instances the very inflexibility of the law even in special local legislation may operate disastrously on a species. Certainly more information is needed as a basis for legislation and greater flexibility in administration.

Much study is needed on factors leading to depletion. Particularly is this essential because many species do not lend themselves to artificial propagation and cannot, therefore, be built up by stocking. In this category are many game species and practically all of the minnows and other forage fishes. Their maintenance is dependent entirely upon environmental conditions. At present, our knowledge is too meager to recognize what constitutes, for example, an overdrain on a species beyond a recoverable minimum or to understand the disturbed relationships of forage conditions caused by the increased pressure of angling, or of excessive commercial fishing, or the full import of pollution conditions.

The question of special protection of feeder streams is another factor in management requiring careful study to keep the waters at a maximum of productivity. In this problem the main thing is to assure a sufficiency of small fish dropping down to populate the larger waters so as to give adequate replacement. The whole question hinges upon other considerations besides the practical difficulties of enforcement including such variable factors as growth rate, migration habits, and other biological conditions. Much study and experiment are needed before a basic policy can be adopted.

3. *Environmental improvement.*—Several examples may be listed:

(*a*) Stream and lake improvement: These are among the more recent developments in fish management. Because the work is still in the experimental stage, a caution that may not be out of place is that the body of water to be improved should have preliminary study so that constructions, if any, may be designed to meet the particular case.

(*b*) Pollution control: Limits of tolerance by fish life, based on dissolved oxygen requirements, are somewhat variously stated as being in the neighborhood of 3.0 parts per million of oxygen with critical conditions obtaining at from 1.5 to 2.0 parts per million depending upon circumstances. Better than tolerant conditions for fish are necessary if edibility is considered, since fish flesh acquires the unpalatable taint of its surroundings.

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Practical methods toward control lie in improvement of methods of waste disposal and in refinements in methods of producing recovery products. Carp control methods have become more or less standardized through the practice of seining to keep the numbers down. Relief measures to be adequate must be organized for permanency. In this connection the economic aspect is an important consideration. When more carp are marketed than are yearly produced, then we may hope to control carp in situations where game fishing is to be regarded as paramount.

Bass control may have one or more objectives, depending upon the situation. Control may be desirable to benefit other species, as, for example, trout in the same water, the control methods thus operating would benefit bass as well; or control may be desirable as a measure of population control to furnish stock for other waters.

Barrier dams are another effective means of control and may be designed to prevent the upward migration of predacious species from impounded waters.

Weed control: The objectives here will vary with the interests involved in a body of water, whether they be boating, bathing, or fishing. The control of the weed known as water chestnut introduced into this country in 1884 and spreading with alarming rapidity has had a very careful study of its life history and habits. Control will demand much labor and expense. The use of chemicals and poisons is still in the experimental stage.

GENERAL CONSIDERATIONS

To acquire the fundamental knowledge necessary for adequate management, enlargement of programs for investigation and research is essential. Experience shows that comprehensive, statewide surveys of the waters afford one of the best methods of approach. Surveys have been or are now under way in several of the States. A good pace has been set by the New York survey because of the comprehensiveness of program. Its salient features may be briefly cited.

It is a long-range program designed to cover the State in a 12-year period. Its primary purpose is to improve stocking practice by the development of a scientifically based stocking policy. The unit of study for each season's work is a drainage basin or such combinations as will permit completing the project in the 12-year period. As the work has advanced, the stocking policy has become effective as widely as possible. Enlargement in scope of program has followed to include many of the basic studies and management developments outlined above.

Its personnel has been drawn largely from the universities of the State, the specialists returning year after year as the survey has advanced into new territory bringing to the work a measure of experience of inestimable value in interpreting the diverse conditions encountered. In this association between the educational institutions of the State and the Conservation Department there has developed in a quite unofficial way a method of cooperation of great importance. It has provided means of developing trained investigators on fisheries problems, has given direction to much needed research at these institutions, and has assisted in the development of a technique for the conduct of surveys.

UPLAND WILDLIFE RESEARCH

MONDAY MORNING, FEBRUARY 3, 1936

Chairman: J. H. FRISON, Chief, State Natural History Survey, Urbana, Ill.
Committee: L. E. HICKS, Soil Conservation Service, Zanesville, Ohio.

DISCUSSION OF DR. KING'S PAPER

Dr. Bump asked Dr. King how one could determine the number of grouse on each acre of land and the environmental conditions. Dr. King said it was through the use of the census method devised in 1930 and has been satisfactorily used since that time. He said that as most of the people present were acquainted with the method he would not take the time to explain it. He said this method gave them figures within 3 percent of actually existing figures on the area.

Mr. Farthingham, Connecticut, asked how the sportsman was to know when the population was high enough to shoot. Dr. King replied that it is not the sportsman's business to determine that. We must depend upon the trained game man for that information, and it is our hope that we will soon have such information available to hunters.

Professor Swenk (referring to the figures on the blackboard) said he didn't understand those figures. Dr. King pointed to certain figures and said, "That is your first evidence of the beginning of a cycle. We knew that in the spring of 1934. If we had used this or similar information we would not have had an open season on Pinnate or Sharptail. We lost birds 3, 4, and 5 years old, and the loss of every one was at the end of a cycle. Their decline is more disastrous than that of the young ones. We must have production here" (pointing to certain figures on the board).

Dr. YEATTER. "Have you any evidence of shortage of food for young birds during the drought years?" "No, we haven't. Our conditions up there in the drought was not normal, but it was quite near normal, and we haven't had any evidence of that affecting the young ruffled grouse. It did in the southern part where the forest area is grown up in a dense canopy and provides no undercover, and, of course, that leaves no food area for the grouse." [This answer was by Dr. King.]

The Reproductive Function in the Cottontail Rabbit (Sylvilagus Floridanus Mearnsii Allen) in Southern Michigan [1]

(By Dr. R. E. Trippensee, professor of wildlife management, Massachusetts State College, Amherst, Mass.)

The importance of the cottontail rabbit is indicated by the fact that in Michigan and Wisconsin the annual take of cottontails exceeds that of all other game animals combined. Ohio, Pennsylvania, and Connecticut have been and are now spending several thousand dollars a year experimenting with the propagation of cottontails for restocking purposes. A summary of the purchases of cottontails in three eastern States for a period of 8 years shows that 102,697 animals were purchased for release, costing in all a total of $71,887.90.

With these economic facts in mind the desirability of knowing as much as possible about the reproductive mechanism of the cottontail becomes apparent. The cottontail, like all of the other lagamorphs and rodents, has poorly developed secondary sex characters. It is possible to distinguish heavy pregnant females in the wild, however, by the unusual depth of their abdomens and the slowness of their movements. Captive males may also be distinguished by the enlarged testes during the mating season. During mating activities it is assumed that where one or more animals followed another that the animal or animals following were males and the one leading a female. Also where an adult defended a nest or was followed by juvenile animals it was assumed the leader was a female.

THE EXTERNAL GENTALIA

The external gentalia of the sexes are very similar. A slit extends ventrally from below the anus and two cavities or anal glands extend from either side of the urethral opening to a position between the urethra and the colon. In the male the penis can be forced out for distinguishing the sexes by pressing the urethral opening forward. It is distinguished from the clitoris of the female by its rounded rather than flat posterior surface and a bend in the dorsal direction. This organ is approximately a half inch long in an adult. Aside from the slightly smaller size of the body of males and the differences already described, there are no distinguishable differences between the sexes.

REPRODUCTION

Ovaries are small gray or yellow bodies along the dorsal body wall caudal to the kidneys. Small dots on the ovaries indicate the position of ovarian follicles and corpora lutea. The ostium abdominale tubae broaden out into two horns or uteri. Each horn of the uterus opens into the vagina by a separate opening. The anal glands are similar in both sexes and secrete a yellow waxy substance which has a strong musky odor. It is not known definitely just what relation this gland bears to the reproductive function.

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[1] The data presented herewith were collected during 1931–34 as a part of information required for a study of the cottontail rabbit. The work was carried out under the direction of Prof. S. A. Graham and H. M. Wight, of the school of forestry and conservation, University of Michigan, at Ann Arbor, Mich.

SIZES OF OVARIES AND TESTES

The ovaries and testes of rabbits vary according to the age of the animal and in the case of the male according to seasonal breeding activities. A summary of the data collected is given in the following discussion:

The study of the ovaries of several juvenile females indicates that these glands are 2.7 by 1 by 0.7 mm at birth. As the animal approaches the lower limit of maturity the ovaries are somewhat smaller than are found for the average of the adults. The average size of the ovaries of adult females is 6.8 by 3.4 by 2.3 mm, the maximum size being 10 by 5 by 3.5 mm.

The testes of an adult male vary in size from less than a gram in weight to as high as 27.4 g. The size and position of the testes seem to be directly correlated with the breeding conditions of the animal. Although the size of the testes seems to be constant for different seasons, their position is somewhat variable and move back and forth from a position within the body cavity through an opening into the scrotum. The testes are in the scrotum when the animal is in breeding condition, although sometimes one testis is found partly in the body cavity when the animal is handled. Moore (1926) has definitely proved the relationship between fertility and the position of the testes outside of the body cavity in the scrotum.

Testes show a gradual growth development from birth to maturity as well as a variation in size during the breeding season. The testes increase from 2 to 3 times in length and as much as 20 to 30 times in weight during the breeding season as compared to the nonbreeding period. The following table shows a comparison of the testes of animals at birth, at the age between birth and maturity, and at maturity during both the breeding and nonbreeding season. The maximum testes measurement is also given.

TABLE 1.—*Comparison of the weights and sizes of testes at different ages and during different seasons*

Age	Weight	Length	Width	Thickness
	Grams	*Millimeters*	*Millimeters*	*Millimeters*
Birth	----------	3.8	2.0	1.5
17 weeks	0.53	16.0	5.0	3.5
Adult, breeding	18.3	51.1	20.0	12.9
Adult, nonbreeding	1.7	22.7	8.5	6.4
Maximum	27.4	54.0	23.0	15.0

The testes begin to increase in size as early as December and the maximum size is reached in April. The size is sharply reduced during the last of July and during August. The cause of this variation is not known. Rowan (1926), working with birds, believes there is a direct relationship between muscular activity and gonad development. Bissonnette (1933), working with birds and ferrets concludes that daily periods of exposure to light are more closely related to sexual activities than is muscular activity, and that in the case of the mammal the seasonal sexual cycle of the female is conditioned by light to a greater extent than the male.

BREEDING CHARACTERISTICS

There is much yet to be learned about the breeding habits of the cottontail. Literature gives no accurate accounts of the many points concerning mating behavior, copulation, the gestation period, and the care of the young. Seton (1929) briefly describes a nest and care of the young, but the evidence is as yet fragmentary in spite of the fact that the cottontail is one of our most common animals.

The Mearns cottontail is promiscuous in its sex relations. The actions of cottontails during the mating period are quite different from the normal nonsexual relations, so mating activities are not difficult to identify but the shy nature of the animal makes any field study difficult. Frequently one animal has been seen pursuing another, presumably a female, and on two occasions more than one animal was observed to take part in the pursuit. From April 19 through May 1932, many pairs of rabbits were seen together repeatedly on the various study areas. An extract from field notes of May 10, 1933, taken during the research reads as follows:

> I noticed two rabbits on the hillside about 6 feet apart in the sun, washing and combing their fur. They were apparently going through a normal process of sunning and cleaning. It appears that I frightened a rabbit from the west side of the road and this animal went up the hillside to the east not far from the two rabbits mentioned. Gradually more rabbits began to appear from the top of the hill and all began working down the west side of the road. I stood perfectly still and the animals came toward me one at a time, all following the same path. The first one stopped to comb and lick its hair about 10 feet from me. Then it hopped past into the pines and three others came up the hill from the north on the same path, each stopping to smell of the ground where the first rabbit had stopped. * * * Grunts and squeals were heard after the rabbits entered the evergreens but the animals could not be observed. In about 10 minutes all of the rabbits recrossed the road and ditch. On the east side of the ditch the four rabbits mentioned were pursued by a fifth and it appeared as though all were chasing each other in single file.

The activity just related was presumably a number of males in pursuit of a female at the height of receptivity. The grunts and squeals correspond to the mating activity as described by Vorhees and Taylor (1933) for jack rabbits. A similar activity was observed on June 18, 1933, in Saginaw County. Here, however, only three rabbits were involved. The process was quite similar to the one described above and was apparently a mating reaction.

SEX RATIO

Two hundred and twenty-nine different cotton-tail rabbits, including all ages, were examined in this study. Of this number 13 were of unknown sex,[2] 123 were males, and 93 were females, or a ratio of 0.43 (Graham, 1929). Trautman (1934), working in Ohio collecting rabbits with a ferret from holes, found a ratio of 0.58 females. The unbalanced sex ratio may be due to a differential ratio of males and females entering traps, and appears to be also true of rabbits collected by shooting. Of 56 rabbits shot during December 1933 at the Kellogg Bird Sanctuary, and reported by Miles B. Pirnie, 34 were males and 22 were females. A study of 32 embryos and newborn rabbits shows 15 to be males, 14 to be females, and 3 of un-

[2] The sex of 13 animals was unknown because of mutilation of the sex organs or because the specimens were examined after the entrails had been removed.

known sex. These data would indicate that the sex ratio of rabbits are 0.5, although there are too few cases to be more than an indication of the facts.

Age at which breeding occurs.—The study of growth indicates that maturity is not reached until approximately the fortieth week. Females born as early as March 1 would thus not reach maturity until December. This would prohibit the possibility of breeding during the first season, as breeding apparently does not take place after the middle of August. This conclusion agrees with the findings of Hammond (1925), concerning the domestic rabbit and with Vorhees and Taylor (1933), studying two species of jack rabbits.

NUMBER OF LITTERS

No direct evidence has been obtained on the number of litters a female may have during the breeding season in southern Michigan. During the study, however, adult rabbits presumably females have been observed with juveniles of two distinct sizes which would indicate at least two broods.

The first litters of young are born as early as March 1 or possibly a little earlier. The period of gestation is approximately 30 days (Nelson, 1909). This would allow plenty of time for four litters per season if copulation followed parturition immediately. Hiller's (Pennsylvania) estimate of 400 rabbits during July from a breeding stock of 40 males and females would indicate that three and possibly four litters were born per season.

$400-40=360$ offsprings.

$360\div\frac{40}{2}$ (females) $=18$ offsprings per female.

$18\div5$ (average litter) -4 litters.

$18\div8$ (maximum litter) $-(2\frac{1}{4})=3$ litters.

All of the evidence collected in southern Michigan indicates that at least two litters are common but even four are possible. The evidence is not sufficient, however, to draw conclusions as to the exact number. A further study should be made by observing marked animals from blinds in large enclosures in order to determine definitely the number of litters per season.

NUMBER OF YOUNG PER LITTER

A compilation of the authentic evidence on the number of young per litter by several workers in Michigan is presented in the following table:

TABLE 2.—*The number of litters each month, the average litter by months, and the average number in a litter based on the grand total*

Month	Number of litters	Total by months	Average by months
March	2	10	5.0
April	10	46	4.6
May	8	43	5.3
June	3	18	6.0
July	2	9	4.5
August	2	10	5.0
Total	27	136	5.04

It is reasonable to suppose that five rabbits per litter is the average number of young for the cottontail in southern Michigan. That this is not the maximum number of young which females of this species can produce is shown by the records of two litters in which eight were present. Cottontails have eight mammae and could nurse this number of young. The uterus is also of sufficient size to carry that number of young, four having been taken from one of the horns of the uterus on two occasions.

DESCRIPTION OF NEST

The nest in which the female deposits the young is a shallow hole dug into the soil approximately spherical in shape. It is presumed that digging and lining of the nest is accomplished by the female. Nests measured have averaged 4 inches deep and 5 inches wide by 6 inches long. The female lines the nest with grass which may sometimes be brought from considerable distances. On May 17, 1932, a partly finished nest was found in an open location in Saginaw Forest with a bunch of dead June grass piled up beside the hole. There was no June grass sod nearer than 50 feet from this location, indicating that this animal carried material for a considerable distance. Fur plucked from the mother's own body is also used as a part of the nest lining. The young are deposited in the nest and covered over with grass or leaves. The nests of the cottontail are frequently placed out in the open but usually near to suitable cover. Of 15 nests observed, 6 had young rabbits in them. The following table gives the location of the nests with reference to cover:

Cut lawn	3
Open hardwoods	2
Under conifer trees	4
Flower beds	2
Briers of fence row	1
Open	3

CARE OF THE YOUNG

Young rabbits are born blind and helpless. Their growth is rapid, however, and at the end of 2 weeks they are able to eat grass and move out of the nest for limited distances.

On August 29, 1932, two small rabbits approximately 3 weeks old were found in a nest near the weather station in Saginaw Forest. In this case the nest was found by watching one of the young follow a trail back to it. Observation in this particular location proved that young rabbits of this age go out short distances from the nest and return. These rabbits were eating grass and other green vegetation even though very young.

The mother rabbit nurses the young by crouching over the nest. The young do not have to leave the nest except to stick their heads up through the top. Isabelle Wandero and Olive Rawson describe seeing an adult female rabbit in the process of nursing its young. When disturbed it bounded away leaving five young in the uncovered nest. Nests with young are usually found covered however. It is probable that the mother rabbit may handle or move the young, although this activity has never been observed by the writer. A nest of five young rabbits was found in Fairview Cemetery, Ann

Arbor, Mich., on April 24, 1933. Adult rabbits were seen in a yard about 300 feet distant from the nest. On April 27, at 12 o'clock noon the nest was observed to have four rabbits in it. At 1 p. m. only one young remained and at 1:15 p. m. no young were present in the nest. No dogs or crows were observed in the vicinity during this time. Observations were made by P. J. West, 1059 Wall Street, Ann Arbor, a worker in the cemetery. It is probable the mother moved the young. In another nest on the campus of the University of Michigan young rabbits disappeared from one nest and appeared in another not more than 10 feet distant. This again indicates a possibility of the young being moved by the mother rabbit.

Direct observations were made as to the ability of the young to call the mother, and of the disposition of the parent to defend the young. On May 10, 1932, a rabbit's nest in Saginaw Forest with two young was disturbed by a red squirrel. One of the young gave out several plaintive squeals and an adult rabbit came to the aid of the youngster, driving the squirrel away. Later one of the captured young was made to squeal by tapping it gently on the head with the finger. It brought the mother back within 10 feet of the spot. Another rabbit also appeared. This second rabbit was driven away by a vicious charge of the first rabbit in which the invader was followed for a distance of 10 rods. From this evidence it would seem that young rabbits have the ability to call the mother, and that the mother remains within calling distance of the nest and is ready to protect the young.

THE BREEDING SEASON

Vorhies and Taylor (1933), working with two species of jack rabbit, *Lepus alleni* and *Lepus californicus*, found pregnant females during all months from January to November, while none were found during November and December. Hammond (1925) found the same to be true for domestic rabbits. Observations in the field indicate that there is a definite breeding season for the Mearns cottontail beginning in the middle of January and extending to the middle of August. Four pregnant females were reported by John Saal, of Tecumseh, Mich., on January 25, 1933. It is unlikely that the rabbits born early in February and March survive unless the weather is unusually mild. A nest of young was found on March 24, 1932, in Saginaw Forest in a nest made in the snow but all were dead. Young rabbits are born as late as September 20. Dr. Ralph E. Yeatter collected a rabbit approximately a week and a half old from a nest of three on September 30, 1932. This is the only record of rabbits being born as late as September.

SUMMARY AND CONCLUSIONS

From the above data it would appear that the following conclusions may be drawn:

1. Male and female cottontails are very similar, especially as to secondary sex characters. Even the external gentalia are so similar that except during the breeding season when the testes are enlarged it is difficult to distinguish between the sexes.

2. The ovaries change very slightly in size after maturity of the animal but the testes increase on the average from 1.7 grams during

the nonbreeding season to 18.3 grams during the breeding season.

3. The cottontail is promiscuous in its sex relationship. Frequently several males are seen following a female during the height of receptivity of the latter.

4. The sex ratio of embryos and new-born rabbits is approximately 50–50, but the ratio of the sexes vary with cottontails taken by trapping or by shooting.

5. The number of litters appear to be more than one, but evidence is too sketchy to draw further conclusions.

6. The average number of young per litter is five for the data collected.

7. The nest is built in a variety of cover types ranging from open sites to densely covered situations.

8. The breeding season extends from January through to August.

9. It appears the life history and life requirements of cottontails are sufficiently different in different localities, so that additional work will need to be done before management of this animal, in localities different from southern Michigan, can be attempted.

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DISCUSSION

Mr. Richard Gerstell (Pennsylvania Board of Game Commissioners, Harrisburg, Pa.). I have had charge of experiments in Pennsylvania in the propagation of the cottontail rabbit; I also have had charge of the purchase of rabbits for restocking purposes. First of all, in regard to the sex ratio of rabbits shot in the wild in large numbers we have noted a heavy preponderance of males, running as high as 85 percent; of rabbits removed from holes, we find that they run as high as 85 percent females. I sexed something over 3,000 rabbits shipped in from Missouri and Kansas and they run 49 percent males and 51 percent females. In regard to the number of litters produced a year I cannot give any definite figures. We do know that one doe produced in a season two litters, the average per litter being five young. We have noticed that there is a distinct

tendency toward cannibalism and premature births 25 to 32 days after copulation. Everything shorter than 28 days was definitely a premature birth.

Dr. Trippensee asked Mr. Gerstell how he checked on the number of males and females? Mr. Gerstell said he didn't take the hunters' word for it. He examined the rabbits himself. (Dr. Trippensee had quoted some figures from a table prepared by Mr. Hiller. Mr. Gerstell said he had died recently and Dr. Trippensee said he would strike out that portion of his paper wherein he had quoted Mr. Hiller.)

Question: "Would trapping give more of one than the other?" Mr. Gerstell said that they had not done enough trapping to know. We only know of those that were shipped to us. Those taken from holes were more females and those shot were more males. The male is on the ground, the female in the hole.

Dr. Bump, Albany, N. Y., asked if there were any figures available relative to the population per acre. Dr. Trippensee said he had that summarized but he didn't remember the figures offhand. He said he would give them to Dr. Bump when he could check his thesis. However he said they were as high as two per acre but varied under different conditions.

The question was asked as to how they worked out purchasing them from other States? Mr. Gerstell said this question hit on a very vital subject on which they were trying to definitely establish a point one way or another. "To date as regards our rabbit releases from Western States I can give you definite information. We released for the last 20 years an average of 50,000 rabbits a year. Normally the gunners in the State kill between two and one-half to four and one-half million in a season, depending on a season. So far as restocking goes, we cannot prove anything, but psychologically it has a wonderful effect. Actually we don't know what percentage live, what percentage die, or what percentage die from vermin."

Dr. Pirnie gave some remarks in regard to his experience at the Kellogg Bird Sanctuary, Battle Creek, Mich. He said that in a 5-year period of legal shooting and on less than 700 acres of land, most of which is very poor, no cover, the total kill is over 850 cottontails in five legal open seasons, some ending January 31 and some ending January 1. This year the take was about 160. * * * "We are not worried about stock this year. * * *."

Mr. Jutson said that in the territory where he lived (Michigan) they were very scarce this year. "We have a law in Michigan which prevents their being killed after January 1 north of what we call ? sixteen. That is what is known as the pheasant belt. North of that is where we have the snowshoe rabbit or jack rabbit which we hunt up to the end of January. The rabbit population in the western part of the State, from my observation, is scarce and we have started a movement to purchase rabbits from other States for restocking Michigan, and that is why I asked the gentleman from Pennsylvania as to how that is working out. The condition is becoming alarming to rabbit hunters, and I was trying to get information as we are anxious to stock up Michigan as well as it has been stocked in the years gone by. We find that the ferrets raise 'Cain' with the rabbits in Michigan and overhunting as well. There are no restrictions. There is no way of checking up unless you stop every hunter who

goes out to determine how many he takes in a season. Just as a matter of suggestion, I would recommend that the States furnish tags to every hunter, and in that way we can put a stop to overkilling. We must have some restrictions more drastic than at present, for our game is going and going fast. That is what is going on in Michigan as far as the rabbits are concerned."

Dr. Trippensee (?) said that we don't depend too much on restocking from other States, for that isn't warranted. He thought that some of the conservation money be given to rabbit research and demonstrations as to how to keep the rabbit population up and instill in the sportsmen the idea of letting each one take the responsibility for one or more of these rabbits in his favorite cover, then money won't have to be spent for restocking.

Dr. Bennitt stated that Missouri is one of the important sources for rabbits for Pennsylvania, New York, and New Jersey, and he said he wanted to serve notice that the rabbit supply is dwindling very rapidly.

Dr. Glasgow of New York remarked somewhat as follows: In connection with the transportation and liberation of rabits, we must take into consideration their diseases, such as tularemia and spotted fever, which are also diseases of man and may be inoculated into man by handling rabbits and by deer flies. We want to take this into account when talking of transporting such animals from one region to another.

Mr. Gerstell was asked the cost per rabbit released in Pennsylvania. He said that they bought them at so much per head; they paid the expressage east and on the empty crates going west, which ran from 85 cents to $1 a head to get the rabbit to the central point in each of the counties. He said it wouldn't be so high this year, and they had been able to make a deal with the express company and it wasn't running over 79 cents apiece this year. He said they could get rabbits cheaper from Oklahoma and Texas, but they couldn't get the quality they get from Missouri at the present time.

Management of Wild Turkey

By H. L. Stoddard, Thomasville, Ga.

There is probably nowhere in the world a finer upland game bird than the eastern wild turkey of North America, which old records show was originally an abundant inhabitant of forested and semi-forested eastern United States. With the advance of civilization and the intensification of hunting, the pure strain has dwindled until, comparatively speaking, but a remnant remains on the larger private preserves, in some of the larger and less accessable swamps and hammocks, and in the wildest of the mountain regions. There is considerable more or less mixed stock, however, in many sections and some which shows more of the domestic than of the eastern wild strain. All this obviously mixed stock may be considered more in the light of a liability than an asset in present restoration programs, and what to do with it presents a serious problem, for only the purest wild strain seems worthy of management effort. If our only aim were to produce meat for the table rather than trophies of the chase, this mixed stock would do very well. It seems to the

speaker, however, that our wild forest lands should be reserved for the splendid wild stock which originally inhabited them, while turkeys of domestic and mixed blood should be confined to the barnyard with the poultry.

Recently there has been a considerable revival of interest in this truly magnificent game bird, and a demand for reliable information to aid its management, for many plans are afoot to restore it to a portion, at least, of its former vast domain. With large continuous areas of forest land finding their way into public ownership, for the avowed purpose of growing forest crops, both for utility and recreation, prospects look brighter for the turkey and those interested in his welfare.

Obviously, attempts to manage and restore such a game bird should be based on a solid foundation of life history research, and comprehensive studies of the eastern wild turkey, as well as its western races, should be started at the earliest possible moment. Such studies should be at least as comprehensive as have been those on the bobwhite quail in the Southeast and the North Central States, as well as those on the ruffed grouse, gambel quail, Hungarian partridge, and the two surviving races of prairie chickens in their respective regions.

But such investigations take much time and meanwhile we must do our best with the scattered information and decimated wild turkey stock at our disposal. It is fortunate, to say the least, that practical wild turkey management has made considerable progress by methods of trial and error on the large private game preserves of the Southeast, while considerable information dealing with foods and feeding habits, parasite, and diseases, predatory enemies of the eggs, young or adults, and so forth, has accumulated in several places, usually as a byproduct of other investigations.

It has been the speaker's privilege, both as an active worker and as an observer, to assist the wild turkey management efforts upon a score of private preserves of the region mentioned; properties where wild turkeys have been brought to abundance and so maintained year after year. He has also had considerable opportunity for field observation and study of the birds on these places, as well as the benefit of practical information resulting from study of the management attempts. This is his only excuse for even attempting to cover the subject assigned him. And the remarks here made apply to conditions east of the Mississippi River, and not to the very different conditions existing in the Southwest, where those interested will have to blaze their own trail.

If the wild turkey is to be restored to even a portion of the eastern range yet adapted to his varied requirements, the need of first importance is an abundance of pure stock for release on areas where no remnant remains. As these barren areas are tremendous, a great many turkeys will be required to even make a good start. The development of this supply of pure-strain stock offers difficulties, it is true, but it can be done if our determination be great enough. Wherever stock of sufficient purity occurs on State or Federal holdings, or on the lands of lumber companies and private individuals, an effort should be made to put the lands under intensive management for the purpose of building up as quickly as possible a surplus

of the birds, which may then be easily trapped, and transferred to areas in need of stock. This will probably be the most satisfactory source, everything considered. A comprehensive survey, however, is greatly needed to determine the amount of such stock and its purity, or lack of it.

This source may well be supplemented, of course, by artificially reared birds of the purest wild strain, provided the breeders can turn out a bird adapted to life in the wild and comparable in every way to the wild-reared birds. Attempts in this line deserve our whole-hearted support.

A second requirement in the restoration of the wild turkey is adequate protection from shooting in areas set aside as sanctuaries or refuges on our public lands while the stock is being developed, and careful regulation of the kill where shooting is allowed. Without adequate attention to these obviously essential requirements success is hopeless, and I may say in this connection that this bird offers a great temptation to the poacher, and is most vulnerable to illegal methods of hunting. Sanctuaries of 20,000 acres to a hundred thousand and upward will be required in the early stages of a restoration program, and they must be carefully selected with wild-turkey requirements in mind, and fully patrolled by the most expert of woodsmen. Even then success is doubtful without the cooperation of local populations.

A third requirement, at least on the public forest lands under acquisition in the Southeast is regulation of the livestock industry on lands where wild turkey and other game are to be developed. As much of the best adopted forest lands are in "open range" and over-run the year around by cattle, hogs, sheep, and goats, owned by forceful people who are determined to continue the time-honored custom—this problem too is a serious one—perhaps the most difficult of all to handle properly. Such livestock are direct competitors for the available food supply during years of limited "mast", and "mast" crops are notoriously irregular. So one of the first and most important problems of wild turkey management is the exclusion of all stock from game sanctuaries or refuges, and regulation, at least, on surrounding areas. This regulation of the livestock industry in the interest of game and recreation, of course, greatly complicates the already difficult problem of public relations. Hence the United States Forest Service and the cooperating State game departments have a difficult nut to crack before much can be accomplished on the huge blocks of public forest land now being acquired, which offer the greatest hope for real wild turkey restoration.

In addition to the consumption of "mast" necessary for the game, domestic grazing animals may gradually eradicate whole groups of herbaceous plants of the greatest value to such game as wild turkeys, quail, and deer. I refer particularly to the native beggarweeds, lespedezas, and other legumes, most of which are intolerant of grazing in the region.

The matter of host relationships of ticks, chiggers, and other parasites common both to certain domestic animals and the game needs much further study. Ticks are known to be serious enemies of turkeys, and hog range in the south is often heavily infested with ticks.

In "open range" areas all plantings for the benefit of the wild turkeys to make up for the loss of the "mast" or to balance the food supply would have to be fenced to exclude the stock. Unfortunately woven wire fence excludes the turkeys about as effectively as it does the livestock, for these birds seldom learn to fly into small fenced areas. This difficulty could be overcome in part, at least, by fencing feed patches with the old fashioned rails, but such supplementary planting in fenced areas may be considered a last resort. By far the better way is to confine the livestock to improved pastures, where they belong, and leave the woodlands to the trees, the indigenous wild creatures, and the recreationalists who would enjoy them.

Wild turkey management, at least in the deep South, may include a certain amount of use of properly controlled fire on the upland pine types to aid in maintaining proper food and cover condition, as a partial control of ticks, chiggers, and other parasites, and to provide fresh green feed for the birds. Supplementary plantings of chufas, peanuts, sorghums, millets, corn, fall grains such as wheat and oats, and so forth, may be made if necessary to increase and assure a varied and balanced food supply.

Any "stand improvement" work in publicly owned forests should be attempted, if at all, with the greatest care, for ash, oaks, beech, black and sweet gum, two species of ironwood, chinquapin, spice bush, flowering dogwood, wild grape, smilax, blackberry, huckleberry, and many others often considered as "weed" species, contribute heavily to wildlife food supply. Wild turkeys draw heavily from all those mentioned, and many others.

They also require a limited amount of open, preferably fallow, ground for securing insect food and fruits necessary to the welfare of the growing young. Such openings should be maintained on lands where they already occur, and provided in heavily forested lands where they do not, as they are of the greatest importance to the welfare of turkeys and much other valuable animal life.

The birds require both well watered and undisturbed range for best results. I want, especially, to emphasize the latter, as turkeys ordinarily do not long remain on range where they are frequently disturbed by man.

For best results certain predatory enemies such as wildrats, foxes, skunks, opossums, stray dogs, wild domestic cats, great horned owls and perhaps others, should undoubtedly be kept in reasonable check. Ordinary commercial trapping of the furbearers can be made to pay in part for warden service, and keep the furbearing enemies from being overabundant.

As management technique was discussed in some detail in a paper presented last year at the game conference, I will avoid going over this ground further, and refer those interested in this phase of the question to the proceedings of that conference.

At the present time, one of the greatest needs of the wild turkey restoration program consists of a recognized standard of perfection so that buyers of so-called wild turkey stock would have a measure of protection from misinformed or unscrupulous dealers. Opinions differ widely as to just what constitutes a wild turkey of the "pre-Colonial" type, and if museum specimens exist to settle the

question satisfactorily, I do not know where they are to be found. The speaker believes that where normal populations of uniformly marked, trimly built, truly wild birds occur, the stock is reasonably good, especially if the birds have long survived, and withstood heavy hunting under truly wild conditions. Such birds flush from the ground as gallinaceous game birds should, can fly upward at a 45° angle with startling speed, and survive in an environment containing a normal population of foxes, wildcats, and similar enemies. It is the speaker's belief that small numbers of such enemies as wildcats have a tendency to keep the stock of wild turkey reasonably pure, as birds with a heavy infusion of the more clumsy domestic strain could not long survive.

Infusion of domestic blood is indicated by lighter tippings of tail and rump feathers, increased greenish and less opalescent red reflection, heavier head, neck and body, longer wattles, shorter and heavier legs, and increased red in the soft gloss of the head and neck. It is especially noticeable in body carriage; the best wild stock resembling somewhat the game cock in posture.

Stocks containing noticeably inferior birds can be improved by periodically culling the off-form and poorly marked individuals, and by introducing gobblers of a superior type. All stocks of truly wild origin and strain should be rigidly protected from the contamination of domestic turkeys, and from the dreaded "blackhead" disease which usually accompanies the domestic chicken flocks. Hence people residing in the national parks, national forests, State or private game preserves and other reservoirs of pure wild turkey stock, should be prohibited or discouraged from keeping free range turkeys or poultry of any sort which might contaminate or endanger the wild stock.

In conclusion, I think we have a real obligation to restore this magnificent creature to suitable portions of the huge blocks of timberland, or potential timberlands now coming under public ownership in the original range of the Eastern wild turkey, and to encourage private initiative in wild-turkey management.

Differences in Nutritive Values of Winter Game Foods [1]

(By Paul L. Errington, Iowa State College, Ames, Iowa.)

The word "food" may be variously defined, but its usual meaning is simply something that an animal eats. It is more or less assumed that an animal eats what it does to obtain nourishment or to supply some physiological need.

The feeding tendencies of vertebrates generally may be rather indiscriminate, as McAtee (1932) in particular brings out. With the exception of relatively few species having specialized feeding habits, most animals eat largely what they recognize as food and are able to get and to handle. Certain items may be eaten incidentally or perhaps only to satisfy an animal's impulse to swallow something.

Wild species seem capable of discriminating to some extent, at any rate, between things that are wholesome or otherwise. It does not necessarily follow that a given species knows exactly those foods

[1] Journal Paper No. J304 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project no. 329.

2050

A, Ducks at Blackwater Migratory Bird Refuge, Md. (Biological Survey photo.)

2060

B, Experimental grain planting at Blackwater Migratory Bird Refuge, Md. (Biological Survey photo.)

B16248

A, Redhead ducks swimming in mouth of Bear River, Utah. (Biological Survey photo.)

B16193

B, Nest and eggs of redhead duck. (Biological Survey photo.)

that are best for it and eats them in exactly the proper proportions; such fineness of discrimination is not ordinarily essential for survival.

Granted that the instincts and individual experience of wild creatures are usually sufficient to guide them in whatever food selection their well-being may demand, they may not have access to the foods they need at critical periods.

Conservationists and persons interested in game management should always bear in mind that foods of wild creatures may differ greatly in nutritive qualities—a fact that should be self-evident but one that is often overlooked in practice.

Winter may be a period of food crisis for seed-eating upland game birds, and a great deal in the way of effectual management for these may consist principally of improving or maintaining the food supply. Indeed, the habitability of large areas of land in north-central United States for the native bobwhite quail or the introduced ring-necked pheasants is linked with the quality, distribution, and seasonal availability of a limited number of staple foods.

Of the thousands of quail and pheasant foods listed by numerous investigators, including Judd (1905) and Stoddard (1931) for bobwhite, only a small proportion are eaten in quantity, and a still smaller proportion of these qualify as important winter staples.

Irrespective of what may be the full role of a specific food in the life history of quail or of pheasants, to be of the greatest value as a winter staple it must have plenty of utilizable protein, carbohydrate, or fat. In other words, it must be heat-producing and energy-giving, whether it is a perfectly balanced food or not. The richness of a food in vitamins, fruit acids, and minerals makes little difference to a bird that is stretched out dead on a snowdrift for want of something substantial enough to live on.

I do not know of any food which is wholly complete in itself to supply the lifelong nutritional needs of quail or of pheasants, and I doubt if such exists, even for adults outside of the breeding season. Laying hens and growing young certainly have more complex dietary requirements than birds that have attained their growth and are sexually quiescent. (See Stoddard, 1931, and Dalke, 1935, for information on the food habits of young bodwhites and young pheasants, respectively.) The literature of physiological chemistry, animal husbandry, and allied sciences contains many references to the effects of prolonged monotony of diet upon one species and another.

Be that as it may, some of the more important winter staples for quail and pheasants under natural conditions show a surprising degree of completeness for purposes of simple sustenance. Yellow corn (*Zea Mays*) is one of these nearly complete sustentative foods. Wild populations of both pheasants and quail have been known to subsist for entire winters almost exclusively on corn, examinations of droppings revealing but the barest traces of other food residues. Birds of both species have been confined experimentally in outdoor pens and given access to no food except corn from January to April, with no average loss of weight (Errington, 1931, 1936).

One lot of adult captive quail, deprived even of access to the ground for grit and minerals, was kept on a straight corn diet for

weeks without dangerous weight losses, though it was plainly seen that these birds could not so continue indefinitely. They demonstrated, nevertheless, a distinct ability to "coast" on a single item of high quality food for a more protracted length of time with less access to grit than they likely would ever be compelled by necessity to do in the wild.

Given an adequacy of regularly available yellow corn, the birds have the nutritive essentials to cope with just about any winter of ice and snow reasonably to be expected within their occupied range. It is conceivable that under exceptionally extreme circumstances—4 or 5 feet of snow persisting all winter in a uniform layer—the birds may suffer from a certain amount of unbalance in diet, but they can endure some unbalance and still survive, little if any the worse ultimately for the experience. Frequently, during winter crises, the birds are fortunate not so much in getting through in prime condition as in getting through at all.

There are other foods which field and experimental evidence prove to be of outstanding value as staples for quail and pheasants, but none for which the case is so clear as that for corn. Among these others may be mentioned soybeans, sorghum, most cultivated grains, achenes of lesser ragweed (*Ambrosia artemisiifolia*), acorn mast (*Querqus* spp.), seeds of pigeon grass (*Setaria* spp.), tick trefoil (*Desmodium grandiflorum*), hog peanut (*Amphicarpa monoica*), jewelweed (*Impatiens* spp.). The evidence at hand indicates that the beans of black locust (*Robinia Pseudo-acacia*) and the achenes of smartweeds and wild buckwheats (*Polygonium* spp.) are valuable foods but have noticeably higher sustentative value when eaten with something else.

It may be remarked that all of the above-mentioned staple foods have salient characteristics in common. They are all foods which are abundant at least locally and which may be often obtained in quantities without excessive trouble on the part of the feeding birds. Most of them represent seeds of conveniently swallowable sizes or foods which may be available as convenient fragments, as in the case of acorns opened and partly eaten by squirrels, hogs, jays, etc. The nutritive material itself is semisolid or hard—but not so hard that it does not yield to digestive action.

Not all foods having these characteristics properly belong in the category of staple foods. The seeds of sweetclover (*Melilotus* spp.) may be eaten in considerable quantities by well-fed as well as by starving birds, yet they seem to have a mildly toxic effect on pheasants and bobwhites which have been fed large amounts. The same seems to be true for the seeds of velvet-leaf or butterprint (*Abutilon Theophrasti*). Some foods apparently have a too great proportion of chaff or of woody debris to serve well as staples. Birds may also have difficulty retaining for digestion seeds that are small or very slippery.

On the basis of field studies, the generalization may be made that few localities in north-central States quail or pheasant country have more than 2 or 3 kinds of staple winter foods in quantities sufficient to supply the needs of moderate populations of the birds. When, through agricultural practices, competition, drought, deep snow, ice storms, or other reasons, the supply of these two or three main staple becomes badly depleted or unavailable, a serious wild-

life crisis is apt to occur. Sometimes the failure of a single staple—whether gradual or sudden—may bring starvation in its wake.

Bobwhites are far less resistant to starvation than pheasants and cannot be deprived of substantial food for more than a very few days at a time without danger. A winter food crisis that lasts a week may be attended by heavy mortality; one that lasts two weeks may all but annihilate populations over wide areas.

Stomach analyses and field observations during these times of food crisis show that, with the exhaustion of the staple foods available, the quail tend to fill up on fruits of sumac (*Rhus*, spp.), wild grape (*Vitis* spp.), rose (*Rosa* spp.), coralberry (*Symphoricarpos* spp.) and sundry others of fleshy consistency or composed principally of indigestible seeds. On diets of this sort, the rate of starvation is retarded to approximately half of what it would be if the birds ate nothing at all. This has been rather thoroughly checked by experimentation with captive birds (Errington, 1931; 1936).

At first glance, many of the data derived from the exclusive feeding of certain single items to captives may seem to have questionable pertinence because of the possible effect of monotony of diet in bringing about the weight losses recorded. It should be made clear, however, that the experiments on the whole were planned to duplicate critical conditions found in the wild, during which free-ranging birds had access to and ate just about the same foods, singly or in combination, that were fed the captives.

For certain foods, we have rather voluminous data on emergency sustenance value from both field observation and experimental sources. The loss rate of bobwhites in the wild, forced on a nearly exclusive diet of sumac berries by a heavy snowfall, is paralleled by the loss rates of birds in confinement on a similar diet—10 or 12 winter days on sumac alone reduces 6½-ounce bobwhites to the dying point in the pen or in the covert.

Checking the significance of field observations and stomach examinations by controlled experiments has proved to be of the greatest utility in giving us a better understanding of ordinary midwinter starvation crises. There are always dangers of drawing too many conclusions from any collection of data, of observational origin as well as experimental. These pitfalls may be avoided best by not getting into them. Experiments which demonstrate that adult quail cannot subsist on a straight sumac diet for more than a short time when exposed to cold weather may be safely said to demonstrate just that and nothing more. They do not demonstrate that sumac has not a place in the year-long diet of the quail, nor even that sumac is not of some value in the event of emergencies.

But it is not the lack of sumac or of like winter-available fruits to which the severest losses of starving bobwhite coveys have been traced. Fruits without doubt belong in the bobwhite's natural diet for any season, winter included, but they, or foods furnishing their equivalent, seem to be commonly present in necessary quantities wherever the winter environment is attractive enough to hold quail in the first place.

In the winter management of wild species, notably the bobwhite in north-central States, far more emphasis should be placed upon keeping the environment well supplied with foods of substantial rather than of succulent or "salad" types, though the latter may be

conspicuously relished. Ideally, the presence of both would be highly desirable, but if any type is to be underemphasized, let it be the "salad." Bright colored berries are no substitute for corn when the snow is deep and the temperature low.

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A Report on the Pillsbury, New Hampshire, Game Management Project

(By J. Paul Miller, U. S. Bureau of Biological Survey)

Late in the fall of 1933 the Bureau of Biological Survey, in cooperation with the New Hampshire State Departments of Forestry and of Fish and Game, established a forest wildlife research project on the Pillsbury State Forest, in the town of Washington, N. H. This 3,000-acre tract is typical of a considerable part of the cut-over forest lands in central and northern New England. The elevation varies from 1,600 to 2,100 feet. There are nine ponds on the area, five of which are controlled by dams. The principal forest type is northern hardwood; spruce, however, is the dominant species in the lowlands and on some of the ridges. The age classes vary from a few very small clear cuttings to mature forest growth. A minor proportion of the area is of open old-field type. The entire reservation is surrounded by similar territory.

The object of the project is to learn facts in life history, especially of the ruffed grouse, and in management practices based thereon that will be useful for application on more or less similar cut-over lands so prevalent in New England. Investigation is proceeding along the following lines:

1. The movements and abundance of certain species.
2. The habitats frequented at various seasons and the characteristics of each.
3. The effect on wildlife populations of silvicultural operations.
4. The development of coverts for the benefit of ruffed grouse and other wildlife and the determination of the value of such alteration of the environment.
5. The production of more efficient food-producing plants suitable for cut-over lands.
6. The improvement of habitats for fur animals.

Limited personnel has made it necessary to devise means of recording and interpreting the evidence with the minimum expenditure of time and effort. Rapid summaries that would give an indication of progress and accomplishments were essential. The method devised

has proved so effective that it is outlined here in the hope that it may prove useful to other research workers.

A series of five to eight maps of like scale are drawn on transparent vegetable-oil-treated paper, the number of maps depending on the species under observation. To aid in reproducing the maps, the use of colors is avoided, shading and cross-hatching being employed to record differential data. The scale used is dependent on circumstances. In the case of the Pillsbury 3,000-acre tract, it was found that a map of the entire area on a scale larger than 1 inch to 500 feet was too big to work with. At the same time this map was too small for the detailed work on the section chosen for intensive work—about 600 acres. For this area a second series of maps was made on the scale of 1 inch to 200 feet.

The first, or base, map should be made with all care, but once completed it does not have to be duplicated. This map shows the principal topographic features and landmarks, such as stone walls, building, fences, and roads.

Map no. 2 is the cover type, or, in this case, the forest-type map. For the purpose of our work it was thought justifiable to consolidate the numerous forest types as designated by the Forest Service into four major groups. Pure hardwood (80 percent or more), pure softwood (80 percent or more), mixed stands, and open fields. The age classes are designated within the types. Subdivisions should conform wherever possible to the standardized forestry groupings, but in some instances these groupings will not suffice; moreover, the various State systems do not conform to the standards of the Federal Forest Service. It is evident that for some types of work the grouping here noted is not detailed enough, but so far its limitations have not been a handicap on the Pillsbury project and it has prevented confusion that might have arisen from a large number of type designations.

Map no. 3 is an outline map of the boundaries only, and silvicultural or stand-improvement activities are noted thereon. Information recorded includes the date the work was done, the kind of treatment given, and any other information that promises to be of use later.

No. 4 also is an outline map on which areas treated for game-cover improvements are indicated. A variety of information is recorded on these maps, such as the areas treated, the treatment given, cash expenditure, man-days labor, date of work, and anticipated dates of repeat operations. In some instances a treatment may be considered as accomplishing the objectives of both stand improvement and cover improvement. In such cases the primary objective determines what map receives the record.

No. 5 and subsequent maps are outline maps on which the results of game censuses are recorded. The species, date, and type of observation are recorded by symbols such as

$$\frac{\text{RG}}{\begin{array}{l}(5)3\text{–}14\text{–}35\ \text{o}\\ \quad 5\text{–}25\text{–}35\ \text{oo}6\\ \quad 8\text{–}10\text{–}35\ \text{X F}\end{array}}$$

The location of the formula on the map is the exact locality at which the observation was made. The above formula abbreviates the fol-

lowing information: Ruffed grouse; in the first instance 5 birds observed on the given date; in the second instance a nest containing six eggs was found on the date recorded and in the same place; later in the season a bird was found dead at this place, apparently killed by a fox. By placing the transparent map on the cover map the nature and age class of the forest growth can be readily determined. By using the stand or cover-improvement maps in like manner, it can be readily ascertained whether the location coincides with that of either of these operations.

It has been found preferable to have separate maps for each species, as such maps are less confusing and require little additional work.

The advantages of the transparent paper are that it permits most of the maps to be mere outlines and multiplies the uses to which each can be put.

To avoid crowding on the census maps and to aid in determining seasonal preferences, records for each 4-month period are entered on separate maps. The logical division for this territory is December, January, February, and March for the first group, the next 4 months in the second group, and the remaining 4 in the third.

The base map and the cover map are permanent. The other maps, being outlines, require little work to duplicate. Regular entry of records keeps the information up to date and in graphic form.

The success of the method is dependent on accurate and frequent censuses. On the game-cover experimental area, lines were painted on trees at 500-foot intervals. The lines were lettered and numbered and were run both north and south and east and west so as to grid the unit. These lines enable the observer to place within a few feet the exact location of any record. On the Pillsbury project a crew of two to six C. C. C. men have been used whenever available for census work. They cover the area thoroughly but without definite routine. In addition two especially trained bird dogs are used in locating grouse; when foliage is on the trees, this is by far the most satisfactory method. When C. C. C. men are used, only a very limited number of species can be dealt with, and considerable trouble has been experienced in obtaining men with the requisite intelligence and dependability. The short enrollment period, the abandonment of camps, the changing of supervising personnel, and other factors have made the use of these men difficult and unsatisfactory.

In the Pillsbury investigation, emphasis has been placed on ruffed grouse. Records to date indicate a limited range for individuals. Grouse continue to frequent a given cover in spite of repeated disturbances. A record of 17 flushes, apparently of a single individual, all within 250 feet of a certain point and covering a period of 10 months, illustrates this characteristic.

The Pillsbury tract is a sanctuary, and no hunting or trapping has been permitted there for the past 5 years. Records show that approximately 31 percent of the birds were killed, apparently by predators, between November 1, 1934, and May 1, 1935. Nearly 50 percent of the nests located were destroyed or abandoned; half the losses, however, were the result of road construction and silvicultural operations. Judging from signs it would appear that foxes were responsible for most of the kills during the winter months. A

large proportion of the kills were found in dense growth under 20 years of age.

After a reasonable course of experiments with cover manipulation, it may be advisable to inaugurate a program of predator control, but properly to evaluate the results of cover management alone, it is necessary for the present to allow predator-prey relationships to remain undisturbed.

Although hunters reported a considerable increase in the number of grouse found in adjacent covers during the past season, only a modest increase was recorded on the investigational area. Distribution of the population changed somewhat, but the total count was only slightly larger this season than last.

Silvicultural work done by the State forestry department has been extensive. In most instances it has had little effect on the wildlife population. Probably this is due to the small number of mature trees removed, the canopy being only temporarily disturbed and the ground cover not being extensively altered. In some cases where the overstory of hardwood was removed to liberate an understory of softwood, some improvement has been noted. This improvement, however, will be of short duration and the ultimate composition is likely to be less favorable to the interests of wildlife than the original. Releasings, thinnings, and improvement cuttings by the foresters show little indication of benefiting wildlife.

Throughout the game-cover experimental area approximately 2,000 old and seedling apple trees are located. Most of these were suppressed and overtopped by forest trees, and the ground cover beneath was very dense. The trees were producing little or no fruit and the evidence indicated that the cover was seldom used by ruffed grouse. By clearing away the ground cover and the competing forest trees (usually of poor species or quality), a series of winding irregular runs was developed, liberating the apple trees and other food-producing plants. Some experimental cultural work was given the liberated plants during the operation, such as pruning, grafting, and cutting back to produce new growth. The runs are connected so that the area treated (approximately 40 acres) is traversed by trails affording a variety of exposures and conditions. The runs provide escape avenues as well as a more available food supply. Escape covers are available on either side of the runs, yet the birds have openings for unobstructed flight. These conditions apparently appeal to the birds, for during the fall months they seemed to concentrate on the area. Whether this influx is of a temporary nature is yet to be determined.

A few openings were created in the forest to determine minimum effective size. Although the evidence is not yet complete, it appears that any opening of a diameter less than twice the height of the canopy will be unattractive and will remain open for such a short time as not to be worth making. Too dense cover appears just as undesirable as lack of sufficient cover, and uniformity of type and age class is undesirable, regardless of the tree species concerned.

Ten experimental food patches of annuals were planted this year. The ground was broken in open areas and various mixtures of hemp, oats, barley, clover, rye, buckwheat, sorghum, and sunflower planted. No attempt to lime or fertilize was made, although the ground

was known to be extremely sour. The patches were complete failures. A test plot heavily limed and fertilized produced good growth, but the grains failed to develop because of the short season. The untreated patches failed to grow. The cost of liming and fertilizing such units can hardly be justified. Most of the work has to be done by hand because of the inaccessibility and rocky nature of the land. As a result of this trial, annual food patches seem impractical in the forested areas.

A small nursery has been established to experiment with the propagation and development of food plants suitable for planting on forest lands. With the information gained and the stock available, it may be possible to establish additional permanent food coverts on the area.

Apple is an important food item for many species of wildlife, yet the individual trees differ widely in their usefulness in forested areas because of the variable tolerance of shade and the diverse characteristics of their fruits and of their bearing habits. Experiments are being made to increase the efficiency of some of the trees on the area by grafting scions from a prolific seedling tree that produces a small tenacious fruit.

Records are being kept on approximately 1,000 food-producing plants, some 30 species, to determine the periods of availability, their acceptability to wildlife, and the best cultural treatments in the field. The fruits of Crataegus, usually considered available for a comparatively long season, have an availability period of not more than 6 weeks for the species growing on the reservation. Wild grape has even a shorter bearing season, and mountain ash a period of about 1 month. Viburnums vary according to species, but the longest fruiting season yet noted for any species just exceeded 5 weeks. Insects, frost, snow, and the rapidity with which the fruits are consumed are some of the factors responsible for the shortening of the period the fruits are available to wildlife.

Mast-producing species with the exception of beech are almost entirely lacking in the area. This year 11,400 acorns were planted on the game-cover area; approximately 40 percent germinated, and the seedlings grew 4 to 10 inches. If the young plants do not suffer too heavy a winter-kill, a good mast-producing unit may result.

Even with the relatively large water surface available on the reservation, the population of aquatic and semiaquatic fur bearers is limited. There is a distinct shortage of suitable duck foods and an apparent shortage of plants that produce food for some of the more common fur bearers. The water, mostly amber-colored and acid, is totally unsuited for many aquatic plants. In 1935 the Fox Fellowship Fund provided a student from Dartmouth College to study quality of water in relation to plant growth, but since the fellowship is a forestry grant, it was necessary to associate the study with some phase of forestry. To do this, the problem was undertaken of determining what effect the forest type on the watershed had on the value of the pond waters. Although the study has not yet been completed, there is no indication to date that the type of forest covering the watershed is responsible for any unfavorable qualities of the pond water except insofar as it may affect the com-

position of the pond bottoms. To further the study a small pond with separate drainage is being created to experiment with plants thought to be adaptable to these waters.

About 2 years ago some beavers were liberated, and although they have moved repeatedly they are still on the area and are increasing in numbers.

Four raccoons are in pens under observation at present. An attempt is being made to determine cost and care necessary to produce good pelts.

The deer herd has failed to increase as might be expected, but at least one limiting factor has been determined, and an effort to offset it is being made this winter.

The Biological Survey extends its welcome to any who may wish to visit the area, and the writer will welcome any opportunity to be of assistance.

Pennsylvania's Field Game Investigations

(By Richard Gerstell, Board of Game Commissioners, Harrisburg, Pa.)

INTRODUCTION

In the spring of 1935, the Pennsylvania Board of Game Commissioners set up as a part of its organization a Division of Game Research.

The commission's past work along such lines had dealt chiefly with the investigation of abnormal and pathological occurrences which occasionally presented themselves. The duty of the new division, however, was to plan and to put into operation a program designed to study in detail the general game conditions, both normal and abnormal, now extant within the Commonwealth and, based on the facts disclosed by such studies, to help formulate policies for the management of the State's various game populations.

SCOPE OF THE WORK

The program as planned calls for a study of each of the principal game species found within the Commonwealth. The same will, in respect to each, eventually embrace three major points: First, a generalized study of the species, including taxonomy, distribution, life history, food habits, variations, parasitism and disease; second, a compilation of the history of the species within the State, with particular emphasis on the past application of management principles and the results otbained therefrom; and third, a series of experiments, some of which will be conducted in cooperation with interested agencies, and all of which will be designed to demonstrate the practicability of and the benefits to be derived from the application of various game management principles.

PRESENT STATUS

Formulated only six months ago, the comprehensive program just outlined has barely been more than inaugurated. The historical data already gathered and the detailed field studies carried on, par-

ticularly during the open gunning season last past, have, however, brought to light a number of valuable, interesting and, in many cases, quite surprising and almost unbelievable facts.

FACTS DISCLOSED

It is at present impossible to discuss without excessive detail certain of the information so far disclosed by the current research program. Various points may, however, readily be comprehended and the same will hereinafter be briefly commented upon, grouped according to species.

RUFFED GROUSE

Field examination of several hundred birds taken by gunners during the month of November 1935 revealed the fact that both the brown and the grey phases of the species are common to the State. In this connection it was, however, significant to note that of 247 birds killed in more than 10 widely separated counties of the Commonwealth, only 6, or slightly over 2 percent of the total, were of the grey phase. All others were brown and no individuals were noted which could be classed as intermediate between the two phases.

Such figures may with interest be compared to statistics gathered by the speaker in northern New Hampshire during the falls of the 3 years 1930, 1931, and 1932. In 148 birds then and there examined, it was found that Pennsylvania conditions were practically reversed and that, in addition, a large percentage of the birds fell in a color group intermediate between the brown and the grey phases. The exact numbers and percentages ran as follows: Grey 82, or 57 percent; intermediate 54, or 36 percent, brown 12, or 8 percent.

The maximum, average, and minimum weights of the grouse killed were somewhat surprising. Spoken and written references to grouse weighing two pounds, or more, are not uncommon, but the investigations so far carried out have revealed no bird weighing more than 1.76 pounds dead weight. The average of 187 birds was 1.35 pounds, while the minimum recorded was 0.79 of one pound. Several adult birds, both male and female, weighed less than one pound and although the fact could not be definitely established, it is believed that these birds were among the first to evidence the approaching down-swing of the grouse cycle.

Here again comparison with grouse taken in Northern New Hampshire is of interest. The average weight of 14 birds (10 adults and 4 immature) shot in that State in October 1935, was 1.29 pounds. Considering the limited number of birds weighed, the same gives a fair approximation of Pennsylvania statistics and shows a top weight of only 1.44 pounds.

Anatomical dissection of 105 specimens picked at random showed that 62 were males and 42 females.

In the collection of crop and gizzard contents for food analysis purposes, limited information relative to the amount of food consumed by a single individual was obtained. The crops of many birds were, of course, empty, but a number of them were full. The largest crop observed was removed in toto from the body and was found to be 9.8 inches in circumference and 1.7 inches in diameter. The

weight of its contents, forty hours after death and kept at room temperature and average humidity, was 2.8 ounces. The contents of another crop weighed 2.3 ounces and contained 322 teaberries, 86 buds and seeds, and 57 small leaves of various species. Still another contained 61 beechnuts weighing .88 of an ounce.

Past records and current field observations indicate that there may be at times in the grouse cycle in Pennsylvania, a lag of from one to two years in both the "highs" and the "lows" as recorded in the grouse populations of those States lying to the north and to the west of the Keystone State. The cycle is at the present time apparently at its peak within the Commonwealth and the tendencies evidenced by the population during the next 15 months will undoubtedly throw more light on this highly important subject.

BOB-WHITE QUAIL

So far, the investigations have brought out little new information relative to this species. It was found, however, that there is, at least in Pennsylvania, some direct relationship between breeding season, rainfall, and the annual production of quail crops. Apparently, years of more than average precipitation tend to produce quail crops of more than average abundance and, conversely, years of less than average rainfall tend toward the production of quail crops of less thn average size. This subject has been fully discussed in the September issue of the Pennsylvania Game News.

Of 47 quail weighed, of which 25 were males and 22 females, the heaviest weighed 6.4 ounces, the lightest 4.6 ounces, while the average was 6.05 ounces. All birds were killed by gunners during the month of November.

RINGNECK PHEASANT

The ringneck pheasant commonly found in Pennsylvania today is a hybrid resulting from generations of cross-breeding between the four pure-line pheasants, the common, or English pheasant (*Phasianus colchicus colchicus*), the Chinese pheasant (*P. colchicus torquatus*), the Mongolian pheasant (*P. colchicus mongolicus*), and the Japanese pheasant (*P. versicolor*).

The weights of 428 male birds taken by gunners have been recorded. The maximum noted was 3.82 pounds, the minimum 2.00 pounds, and the average 2.87 pounds.

Certain population densities recorded in parts of the State may be of interest. Over an area of more than 1,000 acres, winter concentration densities of 2.5 birds per acre have been observed. Also, on areas of over 100 acres, nesting densities of 1 nest to the acre were recorded.

DEER

So far as it has been possible to determine, the deer originally native to Pennsylvania were chiefly true Virginia white-tails (*Odocoileus virginianus virginianus*), although there may have been in the northern counties limited numbers of subspecies *borealis*. Due to the importation of numbers of the latter type from Michigan and northern New England during the period when the deer herd

was relatively small, the present deer herd contains, however, a large number of hybrid animals which can be classified with neither of the groups just mentioned.

There is extreme variation between the various parts of the deer herd found in the different sections of the State. This is particularly true in respect to size. It is believed that this condition is due to the fact that many parts of the Commonwealth are today supporting excessive beer populations, with the result that there is heavy overbrowsing of the range and where the food supply has thus been cut down, the deer have accordingly decreased in size.

Starting with 1935, there will each year be taken full sets of weights and measurements of deer killed in all parts of the State. Complete tabulation of the 1935 statistics has not been made, but it is certain from even casual observation that the figures will present a graphic picture of current conditions. It has been noted that the average weight of 41 legal bucks (having two or more points to one antler) killed in one county where the deer population is relatively light and where food conditions are good was 116 pounds hog dressed. The same figure for 25 individuals of the same type killed in a county only 75 miles distant, but where overbrowsing is widespread, was only 94 pounds. Also, in areas of overbrowsing numerous fawns born in the late spring of 1935 were found in the middle of December to weigh (full weight) less than 30 pounds. On the other hand, on better parts of the range, no such deer were noted and many of the 1935 fawns weighed in excess of 65 pounds.

To prove the belief that much of our deer trouble at present is due solely to the lack of proper food, controlled deer feeding experiments are now under way. Also, a 4-year breeding experiment completed in the summer of 1935, showed that in confinement simulating wild conditions one buck can in a single breeding season successfully mate with 17 or more does and that the offspring resulting from such mating were in every respect equal to the fawns produced when only three or four does were bred by the same buck.

CONCLUSION

Such, in brief, are some of the facts already disclosed by Pennsylvania's new research program. As more information becomes available, the same will be made public with the hope that some of our sister States and Provinces may benefit from our experiences.

DISCUSSION

The Upland Wildlife Research session was carried over into the afternoon with an informal discussion. Dr. King acted as chairman and he said as the time had been short in the morning it did not provide an opportunity for ample discussion of the papers presented and he felt that such a discussion would be of great benefit to all concerned and it would afford a chance to talk over their common problems.

Dr. Alice L. Brown, biologist and embryologist, formerly of Cornell University, gave a talk on her experiments with embryos of the black skimmer. "I have carried on a rather detailed quantitative study on the wild bird, the bird under observation being

the black skimmer, a native along the South Atlantic and Gulf coast. It nests in the sand bars on the ocean side and this is to its own detriment in case of storms. We have collected some 650 embryos which have been studied in detail. I have been very much impressed with the behavior as expressed in these embryos. There is a definite individuality beginning with cleavage. Nutrition is a vital factor in the embryo. I think it should be emphasized. The food before the laying season is a vital factor, too. I would like to suggest, since these factors are very similar in all embryos, that we keep in mind the possibility of a central laboratory from which these detailed studies might be directed and therefore conserve our birds. It is practically an impossibility to get that many embryos from any species. If we had a central laboratory and the information cataloged all those working on various research problems could have access to the records and could confer on the embryological side of the situation."

Dr. King said that one of the most important points in wildlife management and conservation is the importance of fundamental biology but it is necessary to point out that superficial knowledge is not going to get us any place. We have been going on superficial knowledge for 60 years. Wildlife management, to succeed, must be built upon a sound basis of fundamental biology—rule of thumb is fine in an emergency, but we must get down to fundamentals. Wildlife management is not only zoology, but it combines forestry, biology, economics. This discussion a few years ago would have been entirely foreign to game problems. Today it is considered as important as the number of ruffed grouse on a given area, or other game problems. We have to sacrifice some of the specimens, but isn't there some waste involved in the duplication of effort that should be made use of in every way and not for just one line of work? There is a possibility of making better use of the specimens taken. Leaders in conservation are laying themselves open to criticism when they bring about such waste by not making use of the specimen to its fullest extent.

Dr. King explained the systems used by them in the marking of their birds, first, by banding, i. e., by using the regulation aluminum bands; second, by using a combination of colors and chicken feathers. He said they cut chicken feathers down to the size of the grouse tail feathers, dyed the feathers, using a three-color combination, and fastened them with cement. He said they found the chicken feathers very satisfactory as they wouldn't go to pieces when exposed to the elements. He said he did not know of a single instance when the marked feather came loose. They stick very close and if you choose your colors carefully you are able to determine that combination as the birds flush. The color combination is kept in connection with the regular band number. The third method is that of marking the very young birds by means of a surgeon's clip. We attach these in front of the wing and next to the body. It doesn't harm the bird, in fact, we have marked some of our young birds when they were only 30 minutes old. We took a series of ten numbers and kept track of a brood of 10 young. If we recover the birds as adults we put on the regular band and the colored feathers. By this method we can determine longevity, brood mix-

tures, cruising radius, etc. We have found that it was better to have these clips engraved by a jeweler rather than stamped by a stamping machine. The engraving costs one cent up to 1,000 and then 1¼ cents. It causes no harm to the bird and we have never lost a bird by the use of this method of marking. "I thought on several occasions that I had broken a number of wings, but later discovered it was a needless worry." Dr. King cautioned his hearers not to be too optimistic about returns from juvenile birds. The losses are quite high and we have less than 10 percent we have banded for records. You will not get many out of the birds you band. It will take a number of years. We have only banded 37 broods of young in one season on our own area.

GAME BREEDING

TUESDAY MORNING, FEBRUARY 4, 1936

Chairman: MALCOLM DUNN, superintendent, State Game Farms, Forked River, N. J.

Committee: OTTO BEYER, Beyer Game Farms, Portage, Wis.; MARVIN O. POYNER, New York State Conservation Department, Albany, N. Y.

SEMINATURAL GAME FARMS FOR WILD WATERFOWL

(By WALLACE GRANGE, Game Breeder and Consultant, Ephraim, Wis.)

Somewhere between field game management and chicken wire game farming lies a technique combining the advantages of both. This is what I term "seminatural game farming", and to my mind it offers the greatest pathway to advance in constructive game management which we have yet seen. While it is particularly applicable to the production of wild waterfowl, I am convinced that it can be made effective for every species of native wild game which we possess.

The key to success in seminatural game farming is made up of several factors: (1) large tracts of suitable natural environment, either occurring by chance or which have been created by design, (2) complete control over such lands, (3) adequate stocks of breeders, (4) facilities for the hatching and rearing of what may be termed "surplus" eggs and birds, (5) facilities for holding, penning, handling, wintering, and attending the birds the year around.

Probably the most important "key" has not been mentioned, namely, a very keen appreciation of the natural habits of the species in question. Without that, all accessories and adjuncts to the venture are beside the point.

The two main principles upon which seminatural game bird farming must be founded are (1) the fact that most or all wild game birds have a higher egg producing capacity than is normally utilized in the wild, and (2) the fact that normally the mortality of young birds is terrific. Seminatural methods permit the operator a considerable degree of control over these two factors.

Seminatural game farming permits the captive breeding stock to nest in its own manner, in natural cover, and with every reasonable assistance. Efficient keepering is necessary. Nests must be located and successive clutches of eggs must be removed until such time as in the judgment of the keeper it is time to permit the bird to incubate. It is obvious that this involves a high degree of game sense, and considerable manpower. It means that we begin to know our birds as individuals and that we "herd" them like the nomadic peoples of long ago did in subjugating wild sheep to domestication. But our "herding" is done on large land units under close control.

The extra eggs are incubated and the ducklings reared according to the usual methods, either by mechanical equipment or by brood

ducks. For the most part, I find that best results are secured by using surplus mallard and call duck hens for this purpose. They are much less bother than domestic hens, are more efficient, and may be used throughout the season, for when the ducklings have reached a reasonable age, the whole flock may then be turned out in natural ponds. This is important, for the education of a young duck should not be neglected: It is important that young ducklings become wild, that they forage naturally, that they work hard in the pursuit of tadpoles and minnows, and that they learn the importance and use of cover. It is my belief that nothing has been more sadly neglected than the education of most game farm ducks, and that this has been one of the potent reasons why many restocking programs have been unsatisfactory. This does not minimize the importance of first-class breeding stock, however.

Natural enemies are one of the greatest problems on the seminatural game farm. In Wisconsin, most of the control required is confined to great horned owls, which will return night after night to carry off the flock, to crows, whose eyes for nests and taste for eggs is well known, and to such miscellaneous predators as snapping turtles and fox snakes. If these four predators are taken care of, almost all other control can be held to a minimum.

Fencing of the seminatural game farm area is usually required by law. This involves the expenditure of considerable sums of money, but it does assist greatly in handling the stock, in reducing losses of natural enemies, and in controlling trespass. Further, the fencing requirement will tend to eliminate applicants who may be acting in bad faith. It is incumbent upon seminatural game farmers to keep their industry "on the level", and to prevent that type of exploitation which a few years ago threw various fur-farming ventures into disrepute. The surest way to prevent this "wildcatting" is by making the requirements such as will exclude any but legitimate breeders.

Perhaps the major obstacle to the development of seminatural farming of wild waterfowl is the question of a market for the live birds so produced. The present market is largely confined to State conservation departments. This circumstance is satisfactory except for the fact that State departments have a habit of ordering at the last minute. The demand varies from year to year and it is common experience for the breeder to produce a fine flock of birds for which he can find no ready market. He then has his "merchandise left on the shelves", so to speak, with his investment tied up. Probably the next year he reduces this particular stock, whereupon he finds that the State departments are again in the market but he has no stock available. It is very desirable, therefore, that State departments anticipate their waterfowl needs and, if possible, let their contracts from 6 months to a year in advance. The investment required in making environments suitable to seminatural production, including dams, dikes, ponds, buildings, fences, and green-food gardens is such that hand-to-mouth markets operate to destroy incentive. Long-term contracts increase incentive and permit the anticipation of needs and intelligent programs to meet them.

B26643

A, Elk herd on winter feeding ground in Elk Refuge at Jackson, Wyo. (Biological Survey photo.)

B3445M

B, The first buffalo presented to the American Bison Society for the National Bison Range by the C. E. Conrad Estate, Kalispell, Mont. (Biological Survey photo.)

B5581M

Wild turkeys feeding in the Wichita Mountains Wildlife Refuge, Okla. (Biological Survey photo.)

Seminatural game farming is seasonable in some respects, but it fits in most advantageously as a part of a year-round program of propagation. It is a more technical pursuit than ordinary game breeding, and there are no trained men available. It requires large tracts of high-grade game lands, and development over a period of years. As such, it is doubtful whether most State departments can afford to undertake this method. It is properly a case for private initiative, private risk, and private profit. But in the course of its development many useful things will be learned which have direct application to public conservation work.

Our own experiments with wild waterfowl have shown definitely that this seminatural production is feasible. While our efforts thus far have been confined to some 25 acres, we anticipate the opportunity in the near future to demonstrate the method on a large scale. Reports on the project will be made from time to time.

Modern Methods of Quail Breeding

(By M. O. Poyner, superintendent, Middle Island State Game Farm, N. Y.)

The topic which has been assigned to me for discussion is one about which much has been written during the past 5 or 6 years. During these years several developments have been made which have practically revolutionized the artificial propagation of quail. All of them tend toward lower production cost. These developments might best be shown by a comparison of the old and modern methods. These improvements may be classified as follows: (1) Methods of handling laying stock; (2) Brooding; (3) Feeding.

1. METHOD OF HANDLING LAYING STOCK

Several years ago, when quail farming was a new industry, the laying stock was invariably held throughout the year on the ground. In the winter, holding pens approximately 20 by 50 feet were used in which were held from 20 to 40 birds. Much expense was involved in the construction of this pen both for labor and materials and also in maintaining proper sanitation. In the spring, the birds were transferred to laying pens approximately 6 by 10 feet, the birds still being kept on the ground. It was necessary to have a good sod on which to place the pens and enough space so that the position of the pens could be changed frequently. This was done in an effort to insure sanitation and also to afford the birds green vegetation. The same land was usually not used more often than once every 3 years. Between times, it was plowed and seeded and left idle in an effort to reduce disease hazards. This system made it necessary to have two types of pens. Consequently, one was idle about 6 months of the year. This method proved unsatisfactory for several reasons. First, because there were losses of large numbers of birds from disease. Blackhead and quail disease took an enormous toll both in the winter holding pen and in the laying field. These losses were caused primarily by the birds being on the ground and coming in contact with the droppings. Second, because of the expense.

As a result of numerous experiments carried out by various breeders, our modern combination wire-bottom laying and holding pen has evolved. There are many different types of pen, but the principle is essentially the same in all. Today, the same pen is used in the winter for holding that is used in the summer for laying. The pens we use are 4 by 8 feet with a 2-foot shelter and food coop on one end under which is placed a metal dropping pan. We successfully hold 15 to 30 birds in each pen. It has not been found necessary to move these pens either during the breeding season or during the winter. This type pen has reduced the cost of quail production because of: First, smaller amount of material used in construction; second, reduced acreage required both for holding pens and for laying pens; third, reduced labor required to take care of a given number of quail; fourth, lowered mortality from disease.

For quite some time, it was doubtful that fertility and egg production from the breeders on wire would be normal. However, time has proven this method to be satisfactory, though it is undetermined whether it will, in time, lower the vitality of the birds so produced. In 1932 we placed a small percent of our laying stock on wire as an experiment—also placing the same number of birds in pens on the ground as a check. The parentage of the two lots of birds was essentially the same. The feed for both lots was the same except that the birds on wire were fed lettuce twice weekly. While the results from the birds on wire were not as satisfactory as from those on the ground the experiment showed definite possibilities. A comparison of our results to results of like experiments on other farms seemed to indicate a lack of nutritional balance in the diet of the birds on wire. The following year, we repeated the above experiment changing the ration of the birds on wire so that it included a higher percentage of minerals and vitamins. This proved so satisfactory, that in 1934 we placed half our laying stock on wire and in 1935 practically all. The ration in 1934 and 1935 consisted of a commercial breeder's mash to which was added 15 percent dehydrated alfalfa leaf meal and 3 percent meat scrap and 5 percent bone meal.

2. BROODING

Several years ago, most bobwhite quail were reared in the small brooder originated by Mr. W. B. Coleman, the well-known dean of quail breeders. This brooder was wire-bottom and, normally, held from 15 to 20 birds. This method, though proving a boon to quail breeding, left much to be desired from a mass production standpoint because of the large amount of labor required to take care of the birds and because of the expense involved in building large numbers of these brooders. Also, we in the north found it difficult to heat these brooders economically.

The two-section 200-bird quail colony house, originally introduced in 1931 by L. G. MacNamara and successfully used by him, has been enlarged and improved and in 1936 we find a good many farms successfully using the newer type brooder. We at the New York State game farm for the past 2 years have been using three large 10-section colony houses, each section having a capacity of 200 quail.

The dimensions of these houses are as follows: 60 feet long, 7 feet wide, 6 feet high, with a shed type roof. It is constructed of homosote board over a wood frame set on a concrete floor. It is also lined with homosote to reduce heating costs and to facilitate disinfecting. In front of each section is a detachable screen-covered runway 9 by 4 feet by 18 inches also set on a concrete floor. Each section is individually ventilated by the use of a stack ventilator in the back of the room as well as by an adjustable shutter in the upper front wall.

The hovers in these houses are constructed of sheet iron on homosote board with nicrome wire heating elements of 420 watts, each suspended from the iron. Each hover is individually thermostatically controlled. These hovers are built somewhat larger than the usual ones covering about a quarter of the floor space. About 16 inches on each end of the hover is left unheated. This hover because of its large heating surface throws a very gentle, evenly distributed heat and, because of its cooler ends, permits each bird to chose his own temperature without, however, allowing him to get dangerously far away from the heat. For the first week, birds are confined to hover area by placing a board in front of hover, keeping a temperature of 95 to 100 degrees. (The temperature is reduced 5 degrees a week until birds no longer need artificial heat which is usually the fourth or fifth week.) The second week, during the daytime, the birds are allowed the run of the house and also of the runway, providing the weather permits. At night, the birds are again confined to hover area. The third week, birds may be in or out during the day. At night, they are confined to house, but not to hover area. From there up to and including the sixth week, birds are confined to the house only at night and during stormy weather. An exception to this rule is a possible out-break of cannibalism, in which case birds are confined to a darkened house for 2 to 3 days with lights turned on at feeding time. This helps greatly in controlling cannibalism.

In my mind, proper control of humidity is an important factor in successfully brooding quail. We control the humidity on our houses by the installation of two 12- by 16-inch moisture pans, covered with wire, placed under the hover in each section. With the use of these, we are able to maintain a relative humidity of approximately 60 percent. These pans are allowed to go dry after the fourteenth day for experience has shown that humidity is not so important after that time.

The advantages of this type colony house may be summarized as follows:

1. A small amount of labor is required to take care of a large number of birds.
2. The cost of construction of a house that will brood 2,000 birds is less than the construction cost of several one-section colony houses or small brooders necessary to take care of the same number of birds.
3. Reduced heating costs.
4. Our birds brooded in this type house seemed to develop more uniformly. We think this was because of the enlarged feeding space the houses afforded.
5. We have been able to control cannibalism quite satisfactorily.

3. FEEDING

So much has been written during the past 2 or 3 years about the changed and simplified feeding rations that I shall discuss this subject briefly. Our birds are fed as follows: Wet mash four times a day the first week, three times a day the second week, and twice a day the third week. A hopper of dry mash is placed before the birds the beginning of the second week and is kept before them from then on. On the 19th day fine chick scratch is added to the dry mash, one part grain to four parts mash. The proportion of grain is gradually increased until the fifth week at which time mash and grain should be separated—a hopper of each being placed before the birds. The wet mash consists of a commercial turkey grower mash to which, for the first 10 days, is added the yolk of one hard boiled egg to every 100 birds. Fine charcoal and grits are placed before the birds at the beginning of the second week and kept before them from then on. Lettuce is fed from the first.

Using the method outlined, we have been able in 4 years to increase our annual production from 4,000 to 8,600 quail and have, at the same time, materially reduced our production costs.

Pennsylvania System of Artificial Brooding of Ring-necked Pheasants

(By E. C. Smith, superintendent, Fisher State Game Farm, Pennsylvania)

To present, in complete and comprehensive detail, the entire Pennsylvania system of brooding ring-neck pheasants, would, of course, be quite impossible in the short period of time allotted.

However, the following presentation, it is hoped will reveal at least the many important highlights of this phase of ring-neck pheasant propagation.

The season of 1932 was the last brooding of pheasants by the old hen method, which was not a very satisfactory one. The Pennsylvania Game Commission changed over entirely to artificial methods in 1933, which meant discarding the old style equipment and purchasing up-to-date equipment for the new method. This called for the purchase of electric incubators, hatchers, brooder houses, electric hovers, outside sun porches, wire for runs on the ground, and electrifying the whole brooder field overhead. This turned out to be a very wise decision on the part of the Game Commission.

After doing quite a lot of experimental work on the proper litter to use, we found, baled white pine shavings to be the best. We also experimented with several different makes of hovers, some to our sorrow, and found an ideal electric hover which gave us very excellent results.

BROODING

The first step in preparation for the young chicks coming to the brooder field is the brooder house. The litter is spread over the entire floor approximately 2 inches deep. The hover is then placed in the middle of the brooder house with a wire guard consisting of hardware cloth 18 inches wide, extending entirely around the hover to keep the chicks from straying too far away. On the back and sides this guard is about 3 inches away from the hover and in the front

about 24 inches away, this space being used for the feeders and water fountains. Now we are ready for the baby chicks, having the temperature under the hover up to 98°, the starting point, with the outside curtain touching the shavings. The ventilation overhead and the windows are practically closed as we want to eliminate all possible drafts. The chicks are brought to the brooder field in a carrying box that is free from all chances of drafts. We put approximately 250 to a house, having tried anywhere from 200 to 300 chicks per house and find the best results are obtained with 250 at the start of the season. The attraction light under the hover is kept on continuously for 5 to 7 days, turning it off just as soon as chicks will stay under. At all times brooding must have proper temperature and ventilation for them to nestle down in shavings and not crowd, otherwise be contented.

It is quite a job to keep the chicks under the hover the first 2 days until they are used to the heat. The guard is then moved back 24 inches around the hover, the fifth day taken away entirely and the heat reduced 2°, which is done every 5 days. On the seventh day, weather permitting, they are allowed the run of the outside sun porch for 1 hour in the middle of the day and until about 2 weeks old. After this they are allowed on the ground for the first. The hover at this point is being gradually raised to the comfort of the chicks.

The sun porch is 12 feet long, 6 feet wide, made of ½ inch hardware cloth on bottom and sides and 1-inch mesh on top with two doors in top extending the entire width for the purpose of feeding and watering. The entire porch is elevated about 1 foot off the ground. This also makes a very useful pen when transferring birds to holding pens.

The ground run consists of one roll of 6-foot 1-inch mesh poultry wire, extending out from brooder house in triangular shape, which not only helps in driving birds in the house at night but makes it valuable in changing the run to new clover.

The birds are driven in every night and let out in the morning as soon as the dew is off the grass, if there has been a rain in the night they are let on the sun porches instead. The last week in the brooder they do not have any heat at all and have feathered very nicely by this time, when they are transferred to the holding pens at 6 weeks.

FEEDING

The chicks are fed the first 3 days on our 30 percent pheasant starting mash, with a little fine sand mixed in and water. At 6 and 10 a. m., and at 2 and 6 p. m., they are fed sparingly on fine hard-boiled egg sprinkled on mash, to teach them to pick the mash. Three times daily they are given fine chopped greens. On the fifth day we add fine grit, oyster shell, and charcoal. At 3 weeks they are started on fine chicgrain mixed with the mash, and at 5 weeks intermediate scratch is given.

PICKING

A few of the coops show a tendency to pick vents anytime after the fifth day. Such an occurrence requires catching up the entire coop, clipping the upper bill and treating the affected birds with

pine tar. This also applies to feather pulling when birds are 3 to 4 weeks old. It is very important that you have a good crop of clover or alfalfa for the outside runs as this will eliminate a great deal of feather pulling, and give access to an abundance of greens and insect life.

The following are the records of the past three seasons at the Fisher State Game Farm, from the time birds were put in brooders until transferred to holding pens.

	1933	1934	1935
Chicks to brooder	19,764	24,037	22,871
Losses	3,906	1,724	1,528
Raised	15,858	22,313	21,343
Percentage raised	80.6	92.8	93.3

DISCUSSION

Mr. Cook, of Wisconsin, asked the cost of incubation. Mr. Wessell stated that it cost $1.06 for each bird, which included everything—depreciation, the eggs, etc. He was asked if Pennsylvania was releasing any of those birds and he said they had been doing so up to this year.

Dr. Alice Brown, biologist and embryologist, formerly of Cornell University, asked if there had been any studies of the conditions governing the bird during incubation. Mr. Smith said there were no special conditions that he knew of. He stated moisture was practically 97 percent of incubation. He stated that there were two critical periods—the seventh and the fourteenth days. Dr. Brown asked about the earlier days. Mr. Smith said that didn't seem to matter so much. "The seventh and fourteenth days are the critical periods." He said also that the different species of eggs during the period of incubation do not conform one with the other—like the pheasant with the quail. He further remarked that the last 4 days before hatching there cannot be too much moisture.

Game Bird Standards of Perfection

(By Dr. Miles D. Pirnie, director, W. K. Kellogg Bird Sanctuary of Michigan State College, Battle Creek Mich.

At the 1934 and 1935 meetings of the American Game Association at New York there was exhibited considerable interest in game bird "standards of perfection", both among the game breeders and among the game managers. A committee was appointed and made slight progress; yet much remains to be done along this line.

Perhaps it should be stated, first of all, that "standards" as the goal of this activity are not the same in all instances. The standards for wild, native game species are not comparable to the standards fixed for various fancy poultry, show dogs, etc. We assume that the native wild game are "fixed" species, and in regard to them it is our task first of all to find out what natural varieties or species now exist in our country—not to go at it backwards by setting up artificial standards to shoot at in selecting for the breeding hens.

To do this leads almost inevitably to confusion, as witness current squabbles about wild turkey and ring-necked pheasant standards; one person claims color doesn't count, while others think color is a valuable indicator of geographic races or subspecies of the native wild turkey. Such disputes are not ended by taking the word of a few unless these have honestly and thoroughly checked up as to the wild stocks; and this seems to have been done only in part, even by the ornithologists.

Standards for "mongrel" ring-necked pheasants, captive stocks of course, are quite another matter. We start then with stock known to be mixed, part Chinese, and perhaps part Mongolian or Common Pheasant, with varying amounts of green or maroon on the rump, breasts colored from copper to gold, some with wide and some with narrow neck rings, etc. In such a situation the establishing of an artificial standard of color, size, and perhaps of conformity, may be in order. It is doubtful, however, that live birds can be rated and judged satisfactorily on their ability "to get away from the gun", as has been suggested at times. Decisions as to such standards may well be left, it seems to me, to the judgment of the game breeder societies, or the groups primarily interested in raising the ring-neck, as for example, the State game departments and those who supply them with birds. May I suggest that in all probability, the bird to agree upon would be the average of the now native, established stocks of ring-necks in such states as New York and Michigan, where recent releases have had little effect on the nature of the average wild bird—now the product of the natural thinning and weeding out which tends toward "the survival of the fittest."

Let us return to the matter of standards for native, wild game, as, for example, the wild turkey or the mallard duck. Just what data do we need? All animals vary in size and weight according to age and health, and to some extent with the time of year; also they vary in color and density of plumage or hair depending on the stage of molt, and accordingly as fading or wear have wrought changes. There are contrasts between the sexes, both in plumage and size; and also there are differences in the stock in different States, not in all animals but in such game as deer, quail, rabbits, and squirrels. Waterfowl seem to vary less; a wild mallard seems to be little different whether raised in Alaska or Michigan, but Florida turkeys seem quite different than those of Texas or Virginia. On the nature of the sum total of such contrasts hinges our choice of "standard" characters. It should be evident that the nature of existing differences, and their causes, should be investigated before setting about to improve upon Nature—as we would be doing should we go about setting up artificial standards of perfection before we are familiar with existing races or varieties.

But, we are asked, "What can be done, haven't the birdmen adequately described the native game, and can't we decide on standards without further investigation?" I wish we could, but we cannot. The only way to accomplish worth-while results is to busy ourselves at once in growing experimental, purebred flocks from wild eggs (perhaps in some species from captive, wild-trapped stock), then comparing these specimens with flocks grown elsewhere in the natural range of each species. To be sure, allowance must be made for

weight variations perhaps due to feeding differences or because of the presence of diseases. Standard record blanks should be used in describing such test flocks, and all who are working in this endeavor should try to contact others engaged in similar studies. (The new society of wildlife specialists should be a good clearing house for such studies, as well as the organizations of game breeders.)

Museum studies of wild-reared specimens are informing, but they leave us too often in doubt as to the age of specimens; and here is where the captive-reared flock comes to the front. Marked birds, of known age and from the same clutch of eggs, for example, aid in the study of individual variation—something which is not infrequently mistaken for subspecific value. For any game species whatever, if there is doubt as to validity of described or suspected races or varieties, I urge the captive-rearing of sample flocks from wild eggs most likely to be of native (not mongrel), local, wild stock. Standards of perfection cannot be arrived at until this start has been made; and even then, the best standard for any particular region no doubt will be merely the accurate description of average wild individuals, except in the case of black beaver, silver foxes, and the like.

Taxonomic ornithologists have too often assumed we had all needed facts about common game species, but such is not the case. They as well as the sportsmen have given rise to some rather absurd stories about mythical races due to the prevalent failure to recognize for what they are worth the many differences due to age, sex, season, and of the individual. A young black duck collected in September should not be contrasted with an old drake shot in December, for they are not comparable any more than a first-year tom turkey can be rated alongside of an adult. Any good set of standards will recognize and describe both sexes, and young as well as older birds; and this is no small undertaking. The job seems evident; who will do the work?

DISCUSSION

Mr. Culby asked Dr. Pirnie what he considered the average weight of the cock pheasant. Dr. Pirnie said the heavier cock pheasant was not over pounds—about 2¾ pounds at the fall shooting season, many of them being young birds. The hens were close to 2 pounds.

Sanitation on the Game Farm

(By S. M. Costigan, Philadelphia, Pa.)

Our present methods of raising domestic and game fowl have brought us face to face with many important problems which before the advent of the large farms were of little significance.

Pens must be located so as to get the best of the sunshine, the proper drainage of the soil is a factor which must not be forgotten. Damp, poorly drained pens are conducive to disease. Properly balanced rations must be fed. Regardless of the sturdiness of the stock if the resistance is lowered due to unbalanced rations disease can gain a foothold. Unless a program of management which takes in housing, feeding, and sanitation is carefully carried out there will be trouble. One without the others is almost worthless. We are par-

ticularly interested in the prevention and control of disease. The incidence of disease in game and domestic fowl is confronting everyone interested in the industry today.

This brings us to sanitation. One definition of the term sanitation is establishing conditions favorable to health. Applying this definition to the domestic and game fowl industry, we will say then, sanitation on the game farm is the establishment of conditions favorable to maintain the health of the birds.

We realize that the game birds are kept in confinement for only a short period of time as compared with our domestic fowl. This period means a period of concentrated effort in disease prevention. When game birds are released if they are harboring infectious diseases—do you realize what may happen? They are not much good themselves and may pass the disease on to other susceptible species.

It is necessary, therefore, to have clean eggs, clean incubators and brooders, clean air, food and water, clean houses, pens and yards, which with properly constructed and located pens and balanced rations, rearing conditions will be ideal.

The contagious and infectious diseases of birds may be grouped under three classes of causative agents, those caused by bacteria such as pullorum disease, cholera, and tuberculosis; those caused by filtrable viruses, such as the diseases of the respiratory tract, colds, fowl pox, bronchitis, and laryngotracheitus; and, lastly, those caused by parasites, both external and internal, lice and mites, roundworms, tapeworms, and coccidia.

Game birds are prone to these diseases as well as domestic fowl. All of these diseases are transmitted through direct contact with the secretions of birds infected with the disease or through contaminated water, food, or premises. A very important means of preventing the transmission of these diseases is by means of disinfecting water supplies, utensils, and premises, but disinfection without cleanliness is wasted effort. A point in game-bird management is the very necessary factor of construction of pens. Materials of construction are unimportant except that they should be easily cleaned and disinfected, but the size is necessary. We have found that occasionally overcrowding in poultry houses will not cause immediate difficulties. Please do not try this with pheasants or quail. Overcrowding of these birds brings immediate disastrous results.

We may define disinfection as the process whereby injurious bacteria are destroyed. Disinfectants are classed as physical, gaseous, and chemical. The physical agents are sunlight and fire. Sunlight is very important not only from its germicidal properties but because it also has growth-producing properties. Unfortunately, we are not able to get the entire beneficial effects of the sunlight in our pens. Fire is a very efficient disinfecting agent providing it or its heat rays are in contact with the material to be disinfected. There is always the fire hazard and therefore we advocate fire only in the destruction of carcasses and litter from infected premises. The use of the fire gun in pens and brooders has resulted many times in losses.

Recently there was published an article of some work done in determining the effectiveness of the fire gun. It was found that the destruction of the organism causing pullorum disease took more than

15 seconds and for worm eggs and coccidia ocysts in some instances more than 60 seconds. Just calculate the time required to satisfactorily disinfect a pen under such conditions. Steam and boiling water are modifications of disinfection with fire. Here again the contacts must be a definite period. The equipment necessary to do a good job with either steam or boiling water is in most instances cumbersome and expensive. There is always a tendency to shorten the period of disinfection, which means that a complete job has not been done.

Gaseous disinfection cannot be applied as the general plan because it means a temporary discontinuance of the buildings. However, a form is used as you know in incubator disinfection, formaldehyde, and potassium permanganate.

Now we come to the type of disinfection in which I am most interested and which I want all of you to understand, chemical disinfection. It is the most popular method of disinfection today, not only in the poultry industry, but also in the dairy industry. This means of course, a nonpoisonous efficient product. Bichloride of mercury, carbolic acid, cresylic acid, copper sulphate, and potassium permanganate are chemical disinfectants. These products cannot be successfully used as general disinfectants for premises, utensils, and water, nor can they be used for the sterilization of dairy utensils and plant equipment.

The product that can be used successfully is sodium hypochlorite. Its very successfulness in the dairy industry as a sterilizer for dairy equipment and as a disinfectant for contaminated water supplies has led to its adoption by the poultry industry as ideal disinfection for poultry premises and drinking water. It has the characteristics of being nonpoisonous and of having high germicidal properties and is, therefore, a practical means of disease prevention and control.

It was thought by some that disinfection with hypochlorite solutions of utensils was not complete because of the inability of this product to destroy the organism causing tuberculosis. However, some recent work done in our laboratory showed that a solution of sodium hypochlorite containing 200 parts per million available chlorine at 140° C. destroyed the organism causing tuberculosis in humans in less than 30 seconds and heating of the hypochlorite did not cause it to deteriorate.

Now how may sodium hypochlorite be used in preventing the transmission of disease on the farm? Let us consider, first of all, incubators. The floors, walls, and ceilings should be thoroughly cleaned first. Remember disinfection without cleanliness is wasted effort. It makes little difference if you are hatching 50 eggs or 500, disease may still be present.

Now, coops, pens, and brooder houses. Although you keep the young in brooder houses for a matter of 2 weeks or slightly more, this is the time that counts. Keep the youngsters away from the adults. Young birds are most susceptible to disease.

It is very essential that birds have at all times a clean, safe supply of fresh water, and the water should be contained in receptacles which can be easily cleaned and disinfected daily. Because many of the intestinal and respiratory diseases of fowl are readily transmitted through water supplies contaminated by the droppings and

discharges of diseased birds, it is necessary to use a product which will keep the water disinfected at all times but will not reduce the consumption nor interfere with the normal development of the birds.

We have carried on a great many experiments with both baby chicks and adult birds in which the sodium hypochlorite treated water consumption was measured carefully as well as the development of the birds as compared with birds receiving untreated water. The water consumption and development were normal. A bacteriological and chemical examination of the water after 24 hours showed sufficient hypochlorite to be present to keep the water disinfected.

It is necessary to say just a word about yards and runs. There is no disinfectant which will successfully disinfect a yard. Therefore, there is the recommendation of rotation of yards or the removal of the top soil which many times is impractical. Fortunately, we do have partial disinfection of the yards by sunlight.

In considering some of the more important diseases, first consider those that are readily transmitted to domestic birds and those that may be acquired from domestic birds. You all have known of numerous game farms that have a "side line" of chickens. Pullorum disease, the highly infectious diseases of chickens, has been found in pheasants and sparrows. Need we say more about proper sanitation in controlling this? Contaminated incubators frequently are the cause of pheasants acquiring the disease. Pheasant or quail eggs are frequently hatched in incubators which have previously hatched chicks with pullorum disease. The down from infected chicks is contaminated and may transmit the disease to other birds.

Tuberculosis has been observed in fowl other than chickens. Because of the differences of rearing conditions it is not as prevalent, however, the very fact it is found occasionally means care must be taken to prevent the transmission.

Fowl cholera is highly infectious for many of the wild birds. This must be kept in mind. Bear in mind also that the organisms causing the bacterial diseases in chickens also may cause the same disease, particularly in pheasants. You can all readily see, then, the need for a complete separation of the species.

The diseases grouped under the filtrable virus are not all transmitted to wild birds as far as our present-day knowledge goes. Perhaps game birds have acquired an immunity. We don't know. I am speaking particularly of fowl paralysis and related conditions. It has been definitely determined however, particularly fowl pox and laryngotracheitis can be transmitted to pheasants.

The parasitic diseases are numerous. Coccidiosis is found frequently in pheasants and quail. It is a different species than causes the condition in chickens. However, one farm reported to us that they had a severe outbreak of coccidiosis resulting from placing young pheasants in brooder houses which had previously held a group of chicks which had suffered from coccidiosis. We do not know if chances of picking up the infection some place else was definitely ruled out.

Other internal parasites as well as the external ones are present in game birds; unless sanitation is carried out they gain a foothold. We frequently hear breeders say a light parasitic infestation will not cause any difficulty. No; perhaps no immediate, apparent difficulty,

but the resistance of that bird is lowered and it is made more susceptible to bacterial invasions.

Sanitation and prevention of infection must be in the minds of all game breeders. Unless you raise healthy, disease-free birds, you will have inferior stock, which eventually means losses.

Releasing Larger Pheasants

(By Charles W. Wessell, Board of Game Commissioners, Harrisburg, Pa.)

The policy, recently adopted by the Board of Game Commissioners of Pennsylvania, calling for the liberation of larger and more nearly mature pheasants is not merely the result of persistent and constantly increasing demands presented by sportsmen, wildlife observers, and competent field men throughout the State. The policy is based upon a comprehensive and forward-looking view of game-bird propagation and its relation to permanent restocking and game management, as well as upon the realization of the impracticability of liberating young, immature birds.

For several years a program calling for the liberation of 6- to 7-week-old pheasants was put into effect and given a reasonably thorough trial. The advantages, on paper, of such a program seemed quite obvious, permitting as it did a considerably higher production of pheasants at the State game farms, eliminating the trying period of growth, with its attendant difficulties, and reducing materially the cost per bird. In addition it appeared possible through this program to eliminate for the greater part the important and costly items of investment and operation represented in covered holding pens, feed, labor, etc., necessary to bringing birds through to maturity and holding them until the proper time for liberation.

The plan seemed feasible enough and upward of 45,000 pheasants were shipped from the State game farms each year for immediate release. This represented a considerable increase over the number of birds released in any previous year and held out to the sportsmen great hope for more and better gunning.

The actual results from this program, however, obtained from sources most dependable and convincing, revealed the following:

1. That the majority of birds so released did not survive to maturity.
2. That the actual kill of pheasants in first-class ringneck areas steadily decreased.
3. That the plan permitted the birds released of little opportunity for natural propagation, as few survived the gunning season.

Faced by these revelations, supported as they were by authentic reports and observations in the field, a program for releasing larger pheasants was adopted, the principal feature of which was the holding over of an adequate number of cock birds for spring release.

Taking, at our starting point, the position that the ultimate purpose of artificial propagation is to provide more birds afield when the gunning season arrives, and viewing such propagation as merely an aid to, and in no sense a substitute for, natural propagation, we are confronted with the logic that liberation of high quality, matured birds prior to the breeding season—in the proper coverts and looking toward achievement of a balanced sex ratio in established

pheasant areas, as well as more adequate restocking in areas "shot out" or in comparatively early stages of development—will quite probably provide through natural channels of propagation more birds to shoot in the fall.

With a program calling for the liberation of larger pheasants, the game farms may point toward the production of birds of higher quality, may provide for the distribution of new and more vigorous blood in pheasants turned down in the coverts, and more definitely assist the wild-seed stock with its function of providing more and better birds.

Releasing sound, well-developed, matured birds in the early spring, it is thought, will provide at least an opportunity for a maximum reproduction of pheasants in the wild state and with all the attendant advantages of free and natural rearing. Under this plan your hand-reared pheasant is released to face his new and dangerous world "in the prime", so to speak, and at the height of his vigor and power.

In presenting the case in favor of releasing larger pheasants the virtues possessed by the 10- to 12-week old birds are not being overlooked. This bird, released in new, protected, or sparsely hunted areas undoubtedly holds his own and does not present the weaknesses inherent in the much younger bird. But however or wherever he may be released, his chances of contributing materially toward natural reproduction cannot be held as good as those of the mature bird put out in the spring.

The policy of releasing larger pheasants automatically eliminates many weaknesses and undesirable conditions encountered under the 6-week-old system. Additional feeding, protection, and care for a period after liberation, so necessary when birds are released at tender age, is not required. The hazards presented by utilization of later eggs and possible overcrowding in connection with the necessary mass production of 6-week-old youngsters are no longer present. And finally, the chances for the bird's survival when released at maturity in the spring are infinitely greater, to say nothing of his reproduction potentialities already pointed out as being nonexistent in the youngster of 6 weeks old.

Keeping in line, through this policy, with the general trend toward placing more emphasis on natural propagation, and supported by a program of intelligent and constantly enlightened game management, the outlook for more permanent and plentiful pheasant shooting in Pennsylvania is bright with promise.

DISCUSSION

Mr. Farthingham asked Mr. Wessell at what time in the spring they released their birds.

Mr. Wessell stated: "That, of course, is determined by the winter you have had, but usually the last week of February and the first week of March."

Mr. Farthingham asked: "How do you know where to release the birds?"

Mr. Wessel said: "That had to be determined from experience. Game protectors give us help along that line. The cock birds are

put out where the hens have been feeding during the winter and where they apparently show a desire to remain."

Mr. McFarland, of Wisconsin, asked the question as to whether it would be best, in all sections of the country, to liberate the birds in the spring, particularly in those sections where there is not much wildlife.

Mr. Wessell said their plan in Pennsylvania was to liberate the hen birds at about the twelfth to the fourteenth week when they would be sent to the areas in the State where the restocking had been difficult. He further stated that the expense of carrying 12- or 14-week-old birds over a longer period did not warrant a delayed liberation. He stated the cock bird was considered the most important; also, that it would be perfectly safe if the hens were liberated at 12 or 14 weeks of age.

The Legal Status of the Hand-Reared Pheasant

(By Otto Beyer, Beyer Game Farms, Portage, Wis.)

What I am about to say I have said so many times that to me it sounds like nothing more than the echo of my voice from a half-dozen former game conferences. If what I say gets into print it will just be a reflection of what I have written a score of times in various magazines. But I believe in writing a platform and sticking to it, at least until it has been disposed of in a public tribunal. The problem I wish again to present has never had a fair trial at a game conference. Unfortunately my voice does not carry above the din made by the voices of well-meaning amateur sportsmen and professional game savers. That it is not heard is because, as far as commercial game breeders go, it is a lone voice, to the powers that be a mere isolated wail of discontent.

For reasons not understandable to me, the commercial producers of game have never carried their fight with a united front into a single game conference. True, at first they were not over-welcome. But that we will be heard was proven by the fact that after continuously pounding on the door I finally made some headway at the last two or three game conferences held by the American Game Association.

The 1934 American Game Conference went so far as to appoint a committee to write a model game breeding law—a law which would not only permit the rearing of game birds in captivity, but would also provide for the disposal of this crop by shooting over long open seasons and limited only by the number of birds released. I had the honor of being named chairman of that committee, and worked hard and long to draw up what appeared to be a suitable and usable piece of legislation. Did the game breeders take advantage of this opening wedge? To the contrary, another group, drew up another "model" law, which provided for the shooting of all other game birds even though they were not reared in captivity. Neither law was pushed, and the breeders missed a golden opportunity of presenting their problem to a game conference.

This year the game breeders decided to hold a meeting of their own in New York City. Possibly we shouldn't blame them too much. To the powers that be the raising of game birds and the men who

raise them haven't any great bearing on America's game problems. It is far more important to discuss the importance of the influence of sun spots on game, or the details of the love life of the eel, or to spend weary hours lamenting the shortage of game.

But, on the other hand, I have a suspicion that these breeders are saying: "We don't like the way you're running the show, and we're going to have one of our own." Imagine a feeble handful of game breeders being missed at a conference of this magnitude. Maybe we don't like the way someone is running the show, but it is up to us to have guts enough to come to the show and say so. When it comes to discussing the archaic laws which are strangling our business a conference consisting only of game breeders is nothing but a mutual wailing-fest where we do nothing else but weep on one another's shoulders.

The fight is here! Here at this conference! I want to see it carried to the floor of a general conference—if not this year, then next. Not merely by the reading of one paper, but to be discussed for at least a half a day. Then appoint a commission of 10 men, 5 of them to be the best legal talent available, 2 of them to be representatives of the munitions industry and 3 of them outstanding commercial game breeders. The purpose of this commission not to see whether the breeder has a just grievance but to assume that he has and to find a way out. If American jingo editors and politicians won't give us a square deal and can sway our legislators then let's find it out now. Let's not just keep the issue alive for those who are making a living out of the issue, let's settle it!

What is this issue? It is the legal status of the hand-reared pheasant. Just a word about the pheasant. Without doubt it is the most important upland game bird in America today. In point of numbers taken it far exceeds the sum total of all other upland game birds and the time is not far off when it will exceed the total of all game birds, including waterfowl. If I were to tell you that I have a plan whereby the pheasant population of the United States could be increased by 5 million birds 2 years from now and at least 10 million birds annually after that time you would think I was running for office. But I run a commercial game farm and I know what I'm talking about (that's why I would probably never be elected).

How would I bring about this millenium? Simply by ceasing to interfere with one of the simplest laws of economics! The law of producing for profit. The same law which has caused overproduction ever since the time that man first harnessed the forces of nature. How do we interfere with that law in the case of pheasants? Simply by enacting laws limiting the consumption of the game breeder's product. Supposing we enacted a law which said that each person may kill only 2 chickens per year. What would happen to the people who are producing over 500 million chickens every year? You think that's different. How different? Modern methods of pheasant production have placed the pheasant on the same plane as the chicken. While the methods are not the same they are so nearly alike that the same equipment can handle both. Farmer Jones can use his brooder house to raise a batch of March Leghorns, put them out on range at 6 weeks, and then use the

identical equipment to raise the same number of pheasants. And the chances are very good that he will raise a higher percentage of pheasants than he did chickens.

He buys day-old pheasant chicks from a licensed breeder and has excellent luck with them. Let's assume that Farmer Jones does just that. One day he'll find himself before Judge Yokwum who starts out: "In the famous case of *Geer* vs. *the State of Connecticut* the court held that the game belongs to the people. The pheasant is a game bird and you must have a breeder's license to have pheasants in your possession." Farmer Jones get a license and everything is fine—maybe!

His birds come of salable age, and he places an ad in a magazine. It so happens that he knows what his costs are and has sufficient other income so that he isn't obliged to sell his pheasants below cost. Result: He can't sell his birds and still has them in his possession in the fall. At last, tired of feeding them, he tries the city markets. Now, here we come to an important point. A few years ago, when I stated at the American Game Conference that, while everybody present was lamenting the shortage of game, the game-breeders' pens were filled with a surplus, some well-meaning gentlemen suggested that I ought to find a ready market for dead birds in the cities. Talk about willful, brutal slaughter! I raised those grand birds so that some day they might match their speed and cunning against the keen nose of a hunting dog and the marksmanship of the sportsman. Yet these men calmly found a way out of the whole problem by suggesting that I slit the throats and sell the carcass birds that died in vain. And what a miserable answer it was. What did I find? Chicago is my nearest market. Illinois did not permit the sale of pheasants in restaurants, hotels, and so forth. But they were serving hundreds of them at private clubs and banquets. Game farm birds? Not at all. Bootlegged pheasants from Illinois, Iowa, Wisconsin, Minnesota, and South Dakota—bootlegged at $1 to $1.25 each. And my price was $1.75.

I tried the New York market and found that, first of all, the law provided that I must take out a $5 license and then have a conservation official attach a 5-cent tag to each bird. Yet I had already paid a similar license in Wisconsin and attached a 5-cent tag to each bird. Not that I think that the New York law is wrong. In the end it protects the game breeder, and if Illinois had a similar law there would be less bootlegging. But I mention this just to show how little coordination there exists between laws that govern the traffic in pheasants.

After figuring things out, I found that I could do just as well by meeting the Chicago bootleggers' price as by shipping them legally to New York. And then I proceeded to slit the throats of 1,200 pheasants—1,200 potential targets that might have given 1,200 or more thrills to sportsmen. What's wrong with the picture? Why should thousands upon thousands of pheasants have their throats cut each year when everybody, including nonshooters, are tearing their hair about the shortage of game? For an answer, let's go back to Farmer Jones.

Farmer Jones refused to sell his birds for the paltry sum offered. Anyway, he was fond of hunting, and that's why he first took an

168402

A, Ptarmigan in Colorado, in summer plumage. (Forest Service photo.)

222628

B, A white trio—ptarmigan in winter dress. (Forest Service photo.)

314077

A, A Shiras moose at the edge of Hoodoo Lake, Lolo National Forest, Idaho. (Forest Service photo.)

314076

B, A Shiras moose enters Hoodoo Lake, Lolo National Forest. (Forest Service photo.)

interest in pheasant breeding. One day he took his shotgun off the rack and decided to turn some of the cocks out in the brushy tangle in his lower forty. He turned out 10 birds that morning, and late in the afternoon took his old pointer out to see how many he could find. The dog made three successive points, and Jones knocked down three birds as they rocketed into the air. The third bird was his undoing. His jealous neighbor, who, by the way, was on the county, had informed the game warden, and as the third bird fell Jones found himself under arrest. Now, I ask you, for what? For shooting his birds instead of slitting their throats. Just as though it made any difference to the pheasant how it was killed. Once again he faced Judge Yokum and heard him drone the sacred words: "In the famous case of *Greer v. Connecticut*", etc. Why, gentlemen, I could dig into musty old law books and find enough old, unrepealed blue laws to prohibit a good many of our recreations. Science is always progressing faster than the law, and this is particularly true of pheasant breeding. The pheasant-breeding industry is being strangled by the very laws which were enacted to preserve our native game. What's food for one is poison for the other. The pheasant and our native game birds are as different as the sun and the moon, and the same laws cannot be made to apply to both.

I'm not going to argue against the contention that the game belongs to the people. I don't think there's any room for any argument about that, either in this or any other civilized country on the globe. Away back in 1215, when the barons at Runnymede exacted the Magna Carta from King John, the game became the property of the people, to be held in trust by the Crown. American common law followed this precedent; but since we had no Crown after our Declaration of Independence, the game was to be held in trust by the State. And what a fine mess we have made of it.

No; there's no argument about it. The courts, high and low, and of every State, have held that the game belongs to all the people. Mind you, I say all the people. Hunters generally have the idea that the game belongs to them alone. But the 4 million hunters of voting age will find the pursuit of game a thing of the past if the other 36 million voters who do not hunt ever become thoroughly aroused and elect to stop all hunting. They're making more headway every year, and it's no wonder.

For the sake of argument, let's suppose that these 36 million voters elect to stop all shooting. What would you do? Probably the first thing would be to decide to raise your own game. What birds are qualified? The pheasant, the quail, and the mallard duck. The grouse family, including the prairie chicken, are out. Of the three mentioned, the pheasant and the mallard duck are the most easily produced. The shooting of hand-reared mallards has to be done so artificially that you are not interested. Quail are terribly expensive to rear. You have left the pheasant. You raise them and turn them out on your farm. The antishooters have you arrested. Now let's see you squirm. The idea! Arrested for shooting your own pheasants! But that's just the way the commercial game breeder is squirming right now.

You may buy pheasants from a licensed game breeder, and they become your absolute property, providing one doesn't slip out of

your pen. When it does, it becomes property of all the people, to be held in trust by the State. And it is at this very point when the whole game-breeding business is knocked into a cocked hat. State game-breeding laws provide that the area to be licensed must be enclosed by a fence. From the very outset this is superfluous, inasmuch as the breeder would fence his rearing field anyway, not so much to keep his birds in as to keep ground predators out. Obviously a fence, no matter how high, cannot keep his birds in; and as I see it, the principal object of the fence specified by the State it to set some boundary line on the outside of which the State takes title to the birds. When a bird flies over the fence it belongs to the people even though it is still on the game-breeders' property. I am bound to admit that practically all State law-enforcement officers recognize the injustice of this arbitrary stand and give the game breeder a little leeway by permitting him to trap birds along the outside of the fence. But farther than that he may not go, and year after year any possible profit he might have made flies over the fence. If you want to encourage the rearing of more pheasants in captivity—and remember, we can produce them five times as fast that way as they will reproduce in the wild—you will have to make some sort of compromise between the game breeder and the State on those birds that fly over the fence. But for the time being that is a small issue compared to what we must do with the birds that the game breeder has trapped up and has under control in his holding pens.

True, some of us are fortunate enough to be able to sell them to State game departments, but each year this is growing more and more difficult, mainly because most pheasant States have their own immense game farms and they purchase birds only spasmodically, either in proportion to the success of their current rearing season or as additional funds make it possible. And even if there were no State game farms and each State bought all its pheasants from commercial breeders, the saturation point must soon be reached as more men go into the business.

Why not sell them to local sportsmen's organizations? True, some of them go to heroic ends to raise a little money to buy birds or eggs, but for each one of this caliber there are 50 which are on the game-bird dole—waiting for the free eggs, chicks, or breeding stock which the State is trying to make go around on a mere pittance. Take it from me, there's not much sale there. A few of you here may have dug down in your pocket and purchased some pheasants, but let me ask you a fair question. Wouldn't you spend 5 or 10 times as much either for rearing or purchasing stock if you could turn those birds out on your farm and shoot them as you pleased? True, there may be birds in that cover that were planted by the State or by your local conservation club. You used to permit hunting there, but you soon got tired of the depredations of irresponsibles and posted your land. That ended that, and the State could whistle for its pheasants. Now you don't want to shoot those pheasants; you are going to release your own. What possible harm can you do to this stand of pheasants if you release 100 and shoot 100? Of course, there will be cheaters. But just because we have counterfeiters we don't do away with currency. If your State enacted a shooting-preserve law and granted permits to irresponsibles there

would be some who would post a well-stocked area and try to shoot 100 birds for 50 released. But experience shows that where this has been tried the pheasants were soon chased out, and in the second year the retake fell to 50 percent and the third year to the usual 35 to 38 percent of those liberated. Thus, after 3 years the would-be cheater has replaced more birds than he had ever stolen from the State.

Let me make a very definite statement. No matter where it has been tried, a shooting-preserve law which permits a man or club to shoot liberated pheasants over a long open season has invariably resulted in an enormous increase of pheasants in the surrounding territory. This fact is incontrovertible and self-evident. In Wisconsin we have even found that all other game birds are more numerous in and around shooting preserves because of winter feeding programs and vermin-control practices.

A jingo editor and some game-saving demagogues succeeded in all but repealing the Michigan shooting-preserve law. Result: One Wisconsin breeder lost an annual order for 700 birds. A Michigan preserve owner dumped 1,000 birds into Wisconsin, and there is no question but that there are numerous other instances which have not come to my attention.

If you want to encourage game breeding you must extend the ownership of the pheasants which a man buys or raises to the point where he may shoot as many as he releases. Please don't tell us to kill our birds with the knife. We're not butchers. We are game breeders, and that's why we are at a wildlife conference. Don't tell us that such-and-such a club want 10 pheasants for breeding purposes. My game farm is about as well advertised as most game farms, but I would go broke trying to sell my crop of pheasants in that way. We want consumption of our product. And consumption to us means shooting. Here are the sportsmen and conservationists worrying about how we are going to save what game there is left. And here are we, the producers of pheasants, 3,000 of us standing at the post, champing at the bit, eager for the word that will encourage us to double, treble, or quadruple our production the moment we feel secure that we can sell what we raise. We can't sell it if no one will buy it. And no one will buy it unless they can have the fun of shooting it. And why not let them shoot it? Because some demagogue, who can't make a living without duping folks to vote for him, shouts "special privilege." But it's not special privilege for him to ride around in a high-priced car while the game breeder worries along with a 1928 Chevrolet. If a man has money with which to buy pheasants to shoot, in Heaven's name let him spend it. I run a shooting preserve in Wisconsin and bring thousands of dollars of sportsmen's money into my little town. Some of the wealthiest men in the Middlewest shoot at my place, and during the past 4-month season over 1,200 pheasants have left my preserve to stock the surrounding country. I could do a land-office business if I dared risk the capital to put up a permanent hunting lodge. But always there hangs over my head that dread thought, "The law might be repealed", just as has happened in Michigan. I run my preserve on leased ground, much of it useless to agriculture. I would be willing to risk purchasing it and could make it a game paradise if I were certain that the next legislature wasn't going to put me out of business. And here our National Government is worrying about

taking marginal land out of cultivation and our State government is worrying about collecting the taxes on it. And do you know that of the millions of dollars spent by the Government for increasing the wildlife of the country not one cent was spent for the purchase of game? And another thing: Of all the money spent by arms and munitions manufacturers in the name of conservation, not one cent was spent in the purchase of game. Where do we producers of game fit in this picture, anyway? Or don't we fit, and must we hold our own little wailing session in New York and leave it go at that?

If this conference is really honest about doing something to increase the game in this country you can't pass the game breeder by. You've got to get behind some program whereby there will be a compromise between the State and the purchaser of pheasants regarding the ownership of those birds. No time-honored custom is at stake. But we must admit that when American jurists held that the game was the property of the people they did not have the pheasant in mind. And even if they did their decision was made before we knew that we could raise pheasants like poultry and could produce them five times faster that way than in the wild. I repeat, science has progressed faster than the law. I am not rehashing an old problem? I'm presenting a brand-new one. I am not connected with any organization and am absolutely opposed to the platform of any organization that would try to nullify the doctrine that the game belongs to the people. If they are so sincere about that platform why don't they spend $50,000 throughout every State in the Union trying to reverse all the legal decisions now on our books. We game breeders are not interested in that. In fact to call us game breeders is misleading. We are pheasant breeders, 99 percent of us. And if you want to assure this country an extra 10,000,000 or more pheasants a year you're going to back us with a national commission and with enough money to put over a program that will put us on the way of making a decent living. We're hog-tied, gagged, and helpless. Sporting magazines won't dare print what we have to say and we have had to resort to other periodicals. The Saturday Evening Post, Collier's, farm papers are beginning to see the light. But sporting periodicals, the very papers that constantly solicit our advertising, throw up their hands in holy horror whenever we suggest that sportsmen ought to be allowed to reap in the proportion that they sow—pheasants.

If nothing else let us get a decision that when twice removed from the wild they should be considered domestic birds just as we consider mallard ducks which you can shoot without limit at any time of year. But of course mallard ducks are a migratory bird and come under the jurisdiction of the Federal Government. Alright then. If our State legislatures won't give us a fair break then let's take it to our Federal Government, to the Supreme Court if necessary, and find out if any alien bird, brought to this country first, not by State game departments, but by private citizens and first reproduced by the industry of private citizens, can rightfully be called the property of all the people. But we don't want to fight unless we have to. It costs a lot of money and we pheasant breeders will all be starved before the final decision. Let's compromise if we can, as we have done in Wisconsin. But if the Wis-

consin shooting preserve law is ever repealed I hope someone will raise a fund to keep me out of jail because I'm going to shoot my pheasants as long as my arms are free to swing a gun on them.

(After the above presentation it was suggested that some action be taken on Mr. Beyer's suggestion and carried through to the main conference. The chairman appointed a committee of three, namely, Mr. Beyer, Mr. Davidson, and Mr. Cook, to draft a resolution to the effect that the problem of the legal status of hand reared pheasants be presented at the next session of the Wildlife Conference.)

DISCUSSION

Mr. C. A. Justin, president of the Michigan Conservation Congress (a federation of sportsmen clubs) addressed the session as follows (not verbatim):

"I was very much impressed by the address given by the gentleman from Wisconsin (Mr. Otto Beyer). That hits the nail on the head with regard to the question of restocking, and in Michigan, that is where I have knowledge of game birds because I have lived there all my life, and fed birds in the wintertime, put out ducks, and so forth, for rearing purposes, it is a fact that our game is decreasing every year, more and more, regardless of the fact that great efforts are being made to produce more game. We have game farms in Michigan that produce a fair number of pheasants but not enough to stock our State. We have been racking our brains for years to solve the problem and find some way or method whereby we could increase our game in Michigan. We had our Private Preserve Act repealed. Our department of conservation seems to be backing everything on what is known as the Williamson plan. That is simply a plan whereby a group of farmers organize for the purpose of restricting hunting. I am personally well acquainted with this Williamson plan because I have had considerable to do with it. The farmers organized a group and called it the Williamson plan to control hunters. Each farmer is given three tickets to be given to guests to hunt on his farm. That is a small number to hunt on any restricted farm, and when the three tickets are gone they have to look elsewhere for tickets. It is really a trespass control plan and it was started in Michigan in the first place in retaliation of the passing of the Private Preserve Act. It has been changed from one thing to another. Our conservation commission, a politically controlled commission, grabbed at it as at a straw. * * * It is full of holes. I visited several hundred farmers last fall while hunting because I had the time and many of those farmers were sick and tired of the Williamson plan because they said the best hunting was on their places. One farmer said he was going to pull out of it and tell them to go and hunt without a ticket. Some other method must be used to reach the farmer in such a manner that we may produce more game. They haven't adopted any method yet. Our conservation commission at its last meeting proposed paying for the signs that these farmers use to keep hunters off their places. * * * But how are you going to provide more game for the hunter unless you have stock? The Michigan Conservation Congress has proposed a plan that we raise our small-game license in

Michigan, which is now $1 to $1.25. That would bring in a fund of about $100,000. We plan to use one-half of it for pheasants and one-half for rabbits, because the rabbit population has decreased to an alarming point this fall. We plan to go into the next session of the legislature and that is our only salvation under the present set-up in the United States. We plan to go into the next session of the legislature with our bill and have that money earmarked. * * * It is the intention of the sportsmen of Michigan to pay each farmer who will take the eggs from the State game farm. This will be a solution for the game breeder—pay the farmer who raises the chicks to the age of 8 weeks 50 cents for each chick raised. I believe that is the solution of the stocking of our game covers with pheasants. I do not believe a farmer can raise chickens to the age where they may be called a broiler as cheap as he can raise pheasants to the age of 8 weeks. That will mean 100,000 pheasants for Michigan. The other $50,000 will go for rabbits which will have to be purchased from other States and stock them up like Pennsylvania and New Jersey did. Those States have the jump on Michigan in regard to the propagation of game. They stocked up with deer from our State and they have more deer than they know what to do with. In some localities in Michigan we are stocked pretty well but in other places it is pretty thin. It took the sportsmen of Pennsylvania to put through their public hunting refuge plan but it saved Pennsylvania and it is saving Michigan, and who did it? It was the organized sportsmen. It was stated the other day by a gentleman in one of the main groups of the conference that the sportsmen did nothing in an organized manner * * *. Two other States have gone forward with the public hunting refuge grounds. They took $1.50 for each deer license. The money is used for the purchase and maintenance of game preserves and public hunting grounds. It took us 18 years in Michigan * * *. We finally contacted the Michigan State Grange and they backed the plan unanimously and those who were fighting the plan didn't dare monkey with the Grange."

Mr. Cook, of Wisconsin, said to Mr. Justin that he thought it would be better to save that $100,000 additional license money which they contemplated using for eggs to hatch chicks and pay farmers 50 percent for rearing them to the age of 8 weeks rather than give out those eggs indiscriminately—the farmer should be instructed as to how to raise the birds, and so forth, but at that Mr. Cook said they wouldn't get better than 25 percent results. Personal supervision should be given. He suggested spending the money for the purchase of the pheasants from the game breeder even if you have to produce less—you will have live birds and not dead chicks.

Mr. Skiff of New York said: "Every year I have listened to Mr. Beyer's appeal to get game breeders to dispose of their wares and expand their markets. I am between the game breeders and the so-called sportsmen. In the first place, game breeders naturally look at this problem from their own point of view. When they draft legislation and place it in the hands of their legislators they draft it so it is most favorable to their work. They eliminate as many restrictions as possible. The demagogues that have been referred to in Michigan may be responsible for the demise of game

breeding in that State. Our own experience originates from the sportsmen who do not understand what the preserves are doing and feel that there is a special privilege group and they are out to get them. In New York we have a game breeder's law which has the shooting preserve feature in it which permits wide latitude, while at the same time it provides for numerous restrictions and regulations on the game breeder. It requires that certain reports as to how many birds they put out and how many they take in, information on number of breeders and the number of eggs they set and the number of chicks they put in there. A sportsman sees a man taking birds, both hens and cocks, after the legal season is over. He goes to the game commission in mighty wrath. It is a situation which he considers very unfair. All we have to do is to say "Who is this the person"? It is Mr. So-and-So. I get out that man's record which shows that he set so many eggs, he hatched so many, number of chicks he released * * * and that he actually did take so many in every case there is a large percentage goes over the fence, and that sportsman goes away with the satisfaction that it is completely justified * * *. It would be a good thing if similar laws could be enacted in all the States. They could do so with reasonable impunity, with full knowledge that they wouldn't be penalized by other State Departments * * *."

Mr. Wessell was asked if he had any records of the pheasant kill in counties where there are private shooting preserves as against counties without. He said they made a report out from all over the State and they don't keep a record by counties. Most of the preserves had them long before we ever stocked any * * *. Mr. Wessell was further asked if the State kill in sections where you have private hunting preserves—is it worse or better where they do not have them? Mr. Wessell said that he had found in one county where there was such a preserve the pheasant kill has steadily increased since they have been releasing birds in that section.

FORESTS AND FOREST WILDLIFE

TUESDAY MORNING—FEBRUARY 4, 1936

Chairman: DR. H. H. T. JACKSON, United States Bureau of Biological Survey.
Committee: ROBERT DARROW, New York Conservation Department, Albany, N. Y.; PROF. A. A. NICHOL, University of Arizona, Tucson, Ariz.

ISLE ROYALE MOOSE STUDIES

(By PAUL F. HICKIE, Michigan Department of Conservation)

Situated in the north central part of Lake Superior some 13 to 18 miles from the Canadian shore and about 45 miles northwest of Keweenaw Point, the northmost part of the Upper Peninsula of Michigan, is Isle Royale. The area of the island is roughly 210 square miles, or 132,000 acres. Its folded pre-Cambrian strata of volcanic origin have been faulted into series of major and minor ridges with high escarpments to the north and moderate slopes to the south. Spruce, cedar, balsam, fir, alder, and so forth, are found in the wet valleys around the numerous lakes, and bogs with leatherleaf, Labrador tea, and sphagnum are common. Poplar, birch, and balsam fir cover much or most of the upland areas, but bare rock is often exposed on the tops of ridges. Ground hemlock, which at one time formed dense tangles over wide areas, is now found on outlying islands, but is notably absent from the main island due probably to moose browsing. Fire scars of various ages are evident in many places and have had a notable effect on the forest growth.

Numerous investigators have explored and written about the geology, vegetation, and animal life of the island over the past hundred years, but moose were not reported until about 1914, and it seems generally accepted that they came from Canada in the winter of 1912–13 when exceptionally severe weather formed ice solidly to the Canadian shore, although this matter is open to question. We know, however, that shortly after this, moose became common enough for estimates of 200 to be made in 1915, 300 in 1918, 1,000 in 1922, and so plentiful were they in 1928 that estimates varying from 1,000 to 5,000 were made. These figures are open to considerable criticism, but indicate with surety a steady increase in the herd up to about 1929. At that time a moose problem was predicted by many investigators.

That a crisis would arise was biologically inevitable, because the moose were confined to a restricted area and no predators were present that could check their increase. Obviously, if disease did not check them the shortage of food must, and such proved to be the case. The herd has been rapidly declining from about 1933 to the present time when four to five hundred animals are estimated.

Another factor served to make matters worse, for about 1929 the spruce budworm severely attacked the balsam fir, the most im-

portant winter food of the moose on Isle Royale. Bad feeding conditions were further aggravated by this insect pest, which spread so rapidly that over wide areas in 1935, 90 to 100 percent of the balsams that would project above the snow in winter were dead. Most solid balsam stands, of which there are many, are now a desolation. So many moose were found dead in the spring of 1934 that the department of conservation determined to make a thorough investigation of the health of the herd, and of the possibilities of live-trapping and transporting moose as well as of emergency feeding. An assistant and I were delegated to this task and arrived on Isle Royale in November 1934 to spend the winter.

Shooting, if started soon enough, would have been the simplest method of holding the moose in check, but funds were not available for State-paid hunters, and public opinion was opposed, because the facts about food shortage on Isle Royale which were so apparent to game men and biologists as early as 1929, were vigorously denied by many laymen familiar with the island only in the summer, and the department of conservation was suspected of wishing to open a hunting season on moose. The department was not anxious to conduct such a season because of the many difficulties involved, and could not because moose were, and still are, given complete protection from hunting by legislative action.

Our field investigations during the winter showed that the moose were traveling about quite extensively for forage. Mute signs of their all but futile search for food were frequently seen where their tracks in the snow showed they had circled small balsams, already browsed above their reach, then passed on to nibble the shoots of birch, alder, or ash, possibly take a bite or two of dry browse from a fallen balsam, or pause to eat white cedar along the lake shore where drifted snow made traveling all the harder. Moose care little for white cedar or white pine but both are badly browsed. Poplars with teeth marks of moose plainly showing, unlike the bark stripping that normally takes place in the spring, were found in mid-January.

Dead and dying moose were frequently found lying in the heavy snow along the lake shores from January until spring. Twenty-four autopsies by Dr. Don R. Coburn, game division pathologist, have revealed little but malnutrition as the cause of death. The ingestion of unsuitable food appeared to cause a poisoning as evidenced by the abnormal formation of red blood cells in the bone marrow. Heavy infestations of ticks were found on most of the moose, but not pathogenic organism was demonstrated in them and captive moose showed no ill effects from these parasites save the loss of hair caused by rubbing. One calf we found was probably killed by coyotes, but no one can say as to its health and vigor, and three other dead calves were found unmolested, hence predation is probably not of major importance. Forty dead moose were accounted for in the spring of 1934, and twenty more were found in the winter and spring of 1935.

Our attempt to live-trap and transport moose to the Upper Peninsula of Michigan from the island was successful. A single box trap captured 12 animals, while a drop gate set in a corral fence accounted for 4 more. One died, two escaped from our corrals, while two others were released because we did not wish to keep too

many in small corrals. Seven cows, four calves, and five bulls were trapped. Nine of our 11 captive animals were crated in the spring as soon as navigation opened and shipped to a suitable area in the Upper Peninsula of Michigan. The other 8 were sent to the Detroit Zoological Park. Reports received during the past summer and fall indicated those we released were doing well. It was rumored that one was shot by a back-woodsman, but this is not definite. However, poaching is a significant factor in such a restocking program, and to overcome this the Michigan Department of Conservation is again trapping moose on Isle Royale this winter in the hopes of establishing an adequate breeding stock of about 40 animals in each of 2 areas in upper Michigan. The national Park Service has kindly given acquiescence to this program, as well as support from its Civilian Conservation Corps camp, which was on Isle Royale last summer.

During the winter captive animals were fed on balsam, birch, and poplar browse, alfalfa hay, and a variety of grains. Alfalfa hay was not taken readily at first, but later the moose learned to like it, but would touch neither upland hay nor timothy. Alfalfa and other hay was placed along drift fences for moose in the wild, but was not eaten, although balsam saplings were, and moose frequently followed lines of felled balsams and birches to the trapping area. Browse was weighed before and after feeding to give the net amount eaten, an average of about 25 pounds of mixed balsam and birch browse per moose per day. The amount increased with the size of the animal and the severity of the weather.

Studies of emergency feeding consisted of measuring off and cutting 1 acre of fairly typical birch-poplar-balsam cover. The browse was trimmed off and weighed, then fed to our captive animals. Our figures indicated that about 2 tons of suitable feed could be obtained, which amount would feed 1 moose about 75 days. If it seemed desirable to manage the island for the maximum number of moose, our rough computations, little better than guesses, would indicate that considering the relative areas of different cover types and the present browsed-out condition of the vegetation about a thousand moose could be maintained on a 40-year rotation plan if food alone were to be considered. Obviously, to sacrifice other wildlife values for the moose would seem undesirable, but just what sacrifices should be made for them? Without management probably less than half as many moose could be permanently maintained as with it. It is not within the scope of this paper to consider all the intricate ramifications of such a problem, but with further study and refinement along such quantitative lines sufficiently reliable figures might be obtained which would afford a working basis for moose management. Additional information to supplement last year's work is being secured by the party now on the island.

DISCUSSION

Isle Royal is one of the best areas for moose east of the Rocky Mountains.

Mr. Edminster (New York). What was proportion of balsam and birch?

Mr. RUHL. I cannot say. Because of being shorthanded we resorted to measuring off and cutting from 1 acre as explained. The animals picked up on the food they got. From visual examination they did not lose weight. Balsam is very desirable but unless mixed with other food is not sufficient to sustain health. Deer browse balsam as a last resource. They take cedar first. Moose take balsam first due, no doubt, to their stomach content.

Mr. K. A. WILSON. What other animals live on Isle Royal?

Mr. RUHL. Coyote, bobcats, sharp-tail grouse. One porcupine was noted. Deer were planted a few years ago but are no longer present.

Mr. WILSON. What about buffer species such as rabbits, and so forth.

Mr. RUHL. Not many. A few squirrels.

Mr. BONNYCASTLE (Canada). Is it difficult to get there?

Mr. RUHL. It has a rough coast and high banks, but the animals could not swim ashore.

Mr. CONVERSE. What is cause of decrease?

Mr. RUHL. Due to starvation. We have found no disease.

RELATION OF BURNING TO TIMBER AND WILDLIFE

(By H. L. STODDARD, Thomasville, Ga.)

A great deal of publicity has been given to the destructiveness of fire to game and other wildlife. Apparently the great "crown" fires of the North and the West are tremendously destructive to the forests themselves, and at least for the time being fatal to wildlife within them. I can find little in the literature however, as to any possible favorable results to wildlife in succeeding years. Wherever small openings are created in great stretches of dense forest, their beneficial effect on animal life for a period of years is likely to be very great, as are openings or clearings of any kind in unbroken forest. If the fire is largely a surface one, with no great destruction of humus and top soil, herbaceous vegetation, which came in as a first step in the plant succession followed by patches of deciduous brush for browse, must be of marked benefit to certain animal life. Where fires burn to underlying rock over huge areas, as happens in some regions, there can be no question as to its disastrous effect for generations, both on the forest, and to some at least of its animal life.

But not all fires of the North and West are "crown" fires, and studies comparable to those underway in the Southeast are greatly needed as to the effect of light surface fires where such can be used both on certain forest reproductions and to animal environment. Only a few years ago conservationists of the country assumed that the grass fires of the Southeast were invariably destructive of both forest reproduction and animal life, in spite of the fact that an intelligent local population, who had lived in the country for generations, stoutly maintained to the contrary, and pointed out many benefits from their custom of general late winter burning. Now we find as the result of careful and open-minded studies, by Government agencies and others, that fire may be used at times with marked benefit both to certain valuable forest growth and to valuable animal life as well. In fact properly used fire may be considered the

most important tool of the game manager in the Southeast, often an *indispensable* one if quail management be his field. But I want to emphasize the word properly, for improperly used fire is something very different and must not be confused with fully controlled fire used for a specific purpose, which is what I am discussing here. In addition, my discussion today refers only to the coniferous forest region of the Southeastern Coastal Plain, often referred to as the Southeastern Pine Belt. While this is a very large region, it is after all, but a small portion of these United States, so I hope my remarks and generalities will not be misunderstood by those from distant and very different regions. If they will be but stimulated to start open-minded studies and experiments on a small scale in their regions my purpose will have been accomplished.

While we have learned considerable regarding both the use and abuse of fire in the Southeast, the subject is still a hot one for discussion, and in the time at my disposal I can only touch on a few of the high lights in a very general way. For those seriously interested in the subject, there are a good many detailed papers available dealing with the relation of grass fires to soil fertility and structure, to the grazing of livestock, to the reproduction and growth of various valuable forest trees, as well as to quail and other wildlife. And the scientific studies and experiments are still very incomplete, for much remains to be learned.

Our reasons for burning for game.—There are many reasons that make necessary the use of controlled burning for game of this region, but a few of the more important only can be mentioned.

(*1*) Under a policy of fire exclusion, the accumulations of pine straw, dead grasses, and debris exert a smothering effect on the very abundant and diversified leguminous flora, suppressing it in time. As this flora furnishes the "backbone" of the southern quail food supply, and is important to wild turkeys and other wildlife, as well as important to the fertility of soils, the accumulations have to be removed to perpetuate this type of vegetation. Fire is the only known agency for economical removal over large areas of low-priced land.

(*2*) Even if seeds were produced in great abundance in this "rough", which they are not, they would be largely unavailable at least to quail, after falling into the surface litter. Quail feed in and frequent for purposes of nesting, thin, upright, ground cover. Such cover is also superior from the standpoint of hunting and dog work.

(3) Southeastern pinelands, especially in the vicinity of creek valleys where sweet gum, oaks, and other deciduous trees grow and seed profusely, soon choke up with deciduous undergrowth in the absence of frequent burning. This deciduous jungle suppresses such herbaceous vegetation which may have survived the earlier mulching by pine straw, etc. Burning is essential to the perpetuation of the open, parklike pine forest so desired for human habitation, and necessary both to the welfare of the quail and the sport of quail hunting. Deer, turkey, doves, and multitudes of small birds spend much time in the burns during late winter and spring, and we consider such burns important to their welfare also.

(4) Experience indicates that in many cases frequent burning is essential for the control of ticks, chiggers, and other parasites of

wildlife, and so it is desirable for ground cover sterilization as for the purposes previously enumerated.

Effect of fire on the forests.—Were the light pineland grass fires we advocate for use in quail and other game management necessarily destructive to pine reproduction and growth, use of fire might well be limited to the lands held primarily for game and even there its use would be most regrettable. Fortunately, however, burning at certain times and under certain conditions is becoming recognized as sound forestry practice for long-leaf pine, the most widespread and valuable of the southern pines. It can admittedly be carried on in established stands of slash, loblolly, and short-leaf pines, the other valuable southern timber species, if necessary for purposes of game management, control of competing deciduous undergrowth, reduction of the danger of destructive out-of-season fires, etc.

For the sake of illustration, we will cite the case of the long-leaf pine. It is now considered good silvicultural practice to burn pinelands lightly, several months preceding a seed fall so that the seed may find its way to mineral soil, a requirement for the successful establishment of the seedlings. Then fire must be kept out of the area for at least a year after germination, or until the seedlings develop their remarkable fire resistant qualities. After this, light burning may be practised at intervals varying from 1 to 3 years to remove competing vegetation and fire hazard, as well as to keep the young pines free from the deadly "brown spot" disease. Such a program fits in well from the standpoint of game management, and the final result is the beautiful parklike piney woods which originally covered the well-drained uplands in the region under consideration.

Types which should not be burned.—There are other southeastern forest types, however, which, in the light of present information, should be protected from fire, both from the game and forestry viewpoints. The swampy low land woods, with their stands of gum, cypress, oak, bay, magnolia, black and slash pine, etc., are usually protected from fire, except during an occasional year of drought, by standing water or generally damp conditions. The normal fire frequency in such areas may vary apparently from once in 5 years, 10 years, to a hundred or more, but when fire does come it may practically destroy the forest and its immediate usefulness to wildlife. A high percentage of this type burned during the drought of the late summer of 1931, and the effect is ghastly even now.

Another type from which we believe fire should be excluded is that locally called "upland hammock", a climax forest type, the predominant growth being beech, magnolia, oaks, spruce pine, holly, and other characteristic species, all more or less vulnerable to fire. This is a most valuable type for wild-turkey range, though very limited in extent. There are still a few other types that should not be burned, according to present information, but which cannot be discussed within the time at my disposal.

We admittedly cannot produce a maximum game population and the maximum of tree products on the same ground, at the same time. We do contend, however, that we can produce much game on forest lands, with minor modification of forestry practice; also large quan-

tities of timber and other forest products on lands managed primarily for game.

The season for burning.—Fires occurring after trees come out of their period of dormancy, and after ground birds begin their nesting, may be regarded as generally destructive both to the forest and to some of the most valuable wildlife inhabiting it. Such out-of-season fires, if of considerable intensity, may seriously damage even the most fire-resistant species of pines, and, of course, destroy nests or small young of quail, wild turkey, and other ground nesting birds, as well as adversely affecting both their food supply and cover. True, we have found by repeated experiment that fire may be used with exceptional effectiveness in September in controlling deciduous jungle undergrowth, and if carried on in exactly the right way, may even be used at this season under established stands of pine without apparent injury. But practical application of such experiments must, perhaps, await some future time, when our forest and game lands may be in charge of more highly trained and skilled professional personnel.

From the standpoint of the game manager the season to carry on necessary burning is February and March in the deep South. If carried on at this time, leaching and washing of the top soil is reduced to a minimum, as the ground is clothed with new vegetation with remarkable rapidity. Our system of "spot" burning slopes also minimizes the bad effect of washing. Certain frost tender vegetation, especially the important partridge pea (*Chamaecrista* sp.) which sprouts prematurely on newly burned lands, is less likely to be killed by late frosts if burning is carried on after March 1, though the exact time seems to make much less difference to the great class of native perennial legumes. Burning carried on after April 1 finds trees coming out of their dormancy and wild turkeys trying to nest, and should not be attempted.

The technique of light burning.—Methods of light burning for game, including the "spot burning" methods we usually advocate, have been frequently described in detail and cannot be repeated in the time remaining at my disposal. Those thoroughly experienced and trained in the technique of light burning know how to employ fire of just the right degree of intensity for a specific purpose, be it simply the removal of accumulated forest debris, the suppression of undesirable deciduous understory, the removal of standing dead debris remaining from previous fires, etc., with the least damage to valuable pine reproduction.

Suffice to say that the lightest of night burning is usually all that is required for purposes of game management. The aim should, as a rule, be to burn a series of spots varying from half an acre to four or five, as the case may be, according to a definite plan which calls for a certain percentage of the whole terrain to be covered. This is usually accomplished by the setting of separate fires, at distances apart varying from 100 to 300 yards or more, after the cover has begun to dampen by dewfall, on quiet nights. Each fire gradually eats out its acre or acres before increasing dampness causes it to die out, the result being a series of burned spots, separated by unburned cover which serves to diversify and increase food supply and to shelter the animal life while the new growth comes on. Needless to say, sufficient manpower should always be available to take care of

any emergency, while preliminary safeguards should never be neglected. A combination of poor judgment, lack of experience, and neglect of precautions may be dearly paid for.

In conclusion, I hope we may look forward to a future when the needs of both the forest and its valuable wildlife will be thoroughly understood and properly attended to when the forest and forest wildlife will be administered by highly trained and skilled personnel, well versed and practiced in the art of applied ecology. In my opinion such men will not consider fire as the "red demon", but as a useful tool for certain definite ends in game management as well as silviculture. And let us hope that our children and children's children may see deer, wild turkeys, quail, and other attractive wildlife in our forests and so-called waste lands, which, it may be hoped, will be scenic and productive. It is further to be hoped that "barber shop" conservation, and propaganda based on theory rather than research will soon be retired to the junk pile where they belong.

DISCUSSION

Miss Phelps (North Carolina). Is there any study as to the effect on very light sandy soil?

Mr. Stoddard. We avoid burning such types. The subject of fire in the Southeast is in need of a great amount of research.

Mr. McAtee. In the sand hills in Nebraska burning has been recommended to keep down the litter on account of fire hazard.

Mr. Johnson (California). Have you any cost figures on the amount per acre?

Mr. Stoddard. This information is now being gathered. Cost is around 2 to 5 cents per acre depending on how carefully the burning is done. Fire exclusion is not so high but where wildlife is there it is more expensive.

The Experimental Feeding of Deer

(By Prof. A. A. Nichol, University of Arizona, Tucson, Ariz.)

Seventy-five percent of the big game range in the western States [1] lie in the national forest. The management of this game in such manner that it will produce the maximum sustained hunting and recreational returns supplementary to the other resources of the forest is one phase of the work of the United States Forest Service. Profitable use of the forest range by domestic livestock is one other important phase. Since large game animals and domestic livestock are foraging animals, the assignment of range and the division of forage among the many types of occupants is a difficult yet important undertaking. That native wildlife should receive a share of this forage is recognized by all interested parties—and it is further recognized by many that game may make the most economic use on certain types of ranges. What constitutes an equitable division must be determined for each given area, and no standardized method of adjustment can be used over the entire forest range.

There are other phases of this problem, however, which are basic throughout the field. Naturally, these are the factors intimately

[1] A National Plan for American Forestry, U. S. Forest Service, 1933, vol. 1.

associated with the animals themselves. On any range where there is to be cooperative use by both game and domestic stock, one of the first requisites to proper management is a knowledge of the maintenance requirements of those species occupying the area. Forage requirements for domestic livestock are quite definitely known, and satisfactory practices have been in use for years on forest lands. These practices are based on the class of livestock, and the use and palatability of the various types and species of forage plants present. The feed requirements for the maintenance and growth of big game animals, however, have only been estimated. Any division of the forage wealth of a range, therefore, should be based on the number of species of game animals present, and the pounds of forage required to maintain in vigorous health a hundredweight of game animal. The experimental feeding work with deer was initiated at University of Arizona in an attempt to find and prove these needed figures.

This experiment, started 2 years ago, was only made possible through the active help and keen interest of many people. Particular credit must be given W. G. McGinnies, head of the range ecology department at the university, Fred Winn, suprvisor of the Coronado National Forest, Matt J. Culley, in charge of the Santa Rita Experiment Range, S. L. Lewis, State game warden, and Charles P. Beach, Arizona State game commissioner.

LOCATION

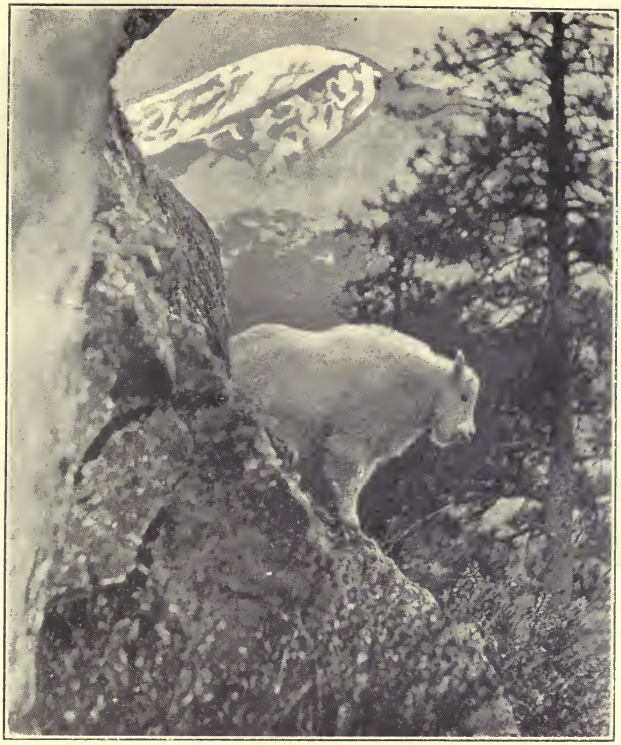
The corrals are located 40 miles south of Tucson in the Santa Rita Mountains at an elevation of 4,200 feet. On northern exposures of the mountains in southern Arizona this altitude represents the lower edge of the oak belt, and the upper edge of the mesquite. Grass is the principal ground cover. Thornbush, such as the acacias, mimosas, and hackberries, follow the washes, and shrubby legumes are common on the rockier ridges. This is typical Arizona white-tail country; and is the upper limit of the range of the desert subspecies of the Rocky Mountain mule deer. Snow rarely falls, and some green forage is available the year around.

WORKING MATERIALS

The deer used in this experiment are the two species common to Arizona: the Rocky Mountain mule deer (*Odocoileus hemionus*)[2] and the Arizona whitetail (*Odocoileus couesi*)[2]. The feeding work was started with 9 deer; three buck and four doe mule deer from the Kaibab herd, and one buck and one doe whitetail from the Santa Rita Mountains. All the animals were approximately 2 years old at the beginning of the experiment. Since then the herd has been increased to 24 individuals, but it now numbers 14, which is as many as can be properly handled with the present facilities.

In the beginning the feeding trials followed for guidance the more or less standardized method used in the feeds and feeding of domestic stock. There was much trial and much error, and we

[2] Anthony, H. E., Field Book of North American Mammals. Putnam, 1928, 625 pp., illus.



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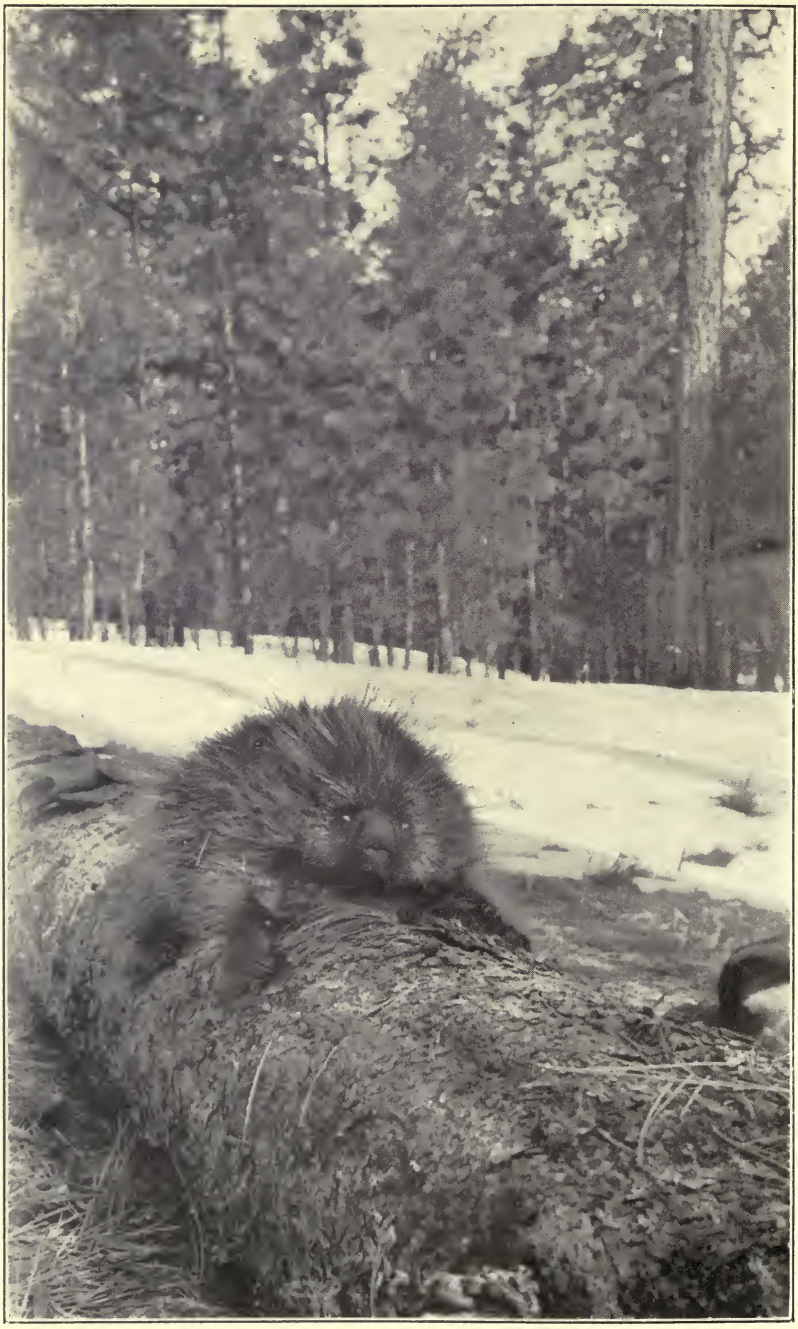
A, Mountain goat in the Chelan National Forest, Wash., looking over a precipice. (Forest Service photo.

B33429

B, Four-year-old buck white-tailed deer in Sullys Hill National Game Preserve, N. Dak. (Biological Survey photo.)



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Porcupine in Carson National Forest, N. Mex. (Forest Service photo.)

are still finding many recommended methods must be altered to meet deer physiology, psychology, and morphology. An illustration is the reverse evolution the feeding racks went through. A desirable feed rack is one which is accessible to the deer, minimizes waste, facilitates removal of the residue, and protects from the weather. To this end the racks were built with a slatted front, hopper back, and rounded residue tray. The slats in front were wide enough to permit the deer to put their muzzles between the bars to nip out the feed. This, however, they would not do. They would eat only that portion of the forage which protruded outside, and would go hungry rather than work between the slots as will sheep and cattle. A partial explanation of this was found when later observations showed that whenever possible deer prefer to bite their forage off with the molars rather than use their incisors. Since one of the essentials of the feeding work was to recover all uneaten portions, to prevent scattering and to minimize wastage the feed rack was an important item. So the hopper feeder moved through a series of modifications, each time toward a more simplified construction, until now we know that an entirely satisfactory feed rack is a simple, shallow, open tray. On first inspection this would appear as offering greater opportunity for waste. An observed peculiarity of the deer when feeding, however, suggested a slight change in the location of the trays, which resulted in a great decrease in the amount of feed scattered and lost. Whenever possible, deer are inclined to feed with their front feet elevated above the ground level. Placing the trays on platforms 4 or 5 inches thick and extending beyond the edge of the troughs some eight inches resulted in the deer standing much quieter and with a great deal less head turning to drop food fragments on the ground.

The feed was weighed in early morning and evening, after the residue of the previous feeding had been weighed out and recorded to obtain the net consumption. The water supply was piped from springs into individual troughs. An automatic overflow pipe facilitated accurate filling, and a floating gage calibrated in quarts gave a quick and direct reading of the amount of water consumed. A check trough in a similar exposure recorded the loss by evaporation. Salt was made available in 4-pound pressed blocks, protected from the weather, and weighed at irregular periods, corresponding to the end of a series of days without rain or high humidities. A check block was also used. Mineral rations were handled in a like manner. Semishelters were built to give only as much protection from the weather as the deer might reasonably be expected to find for themselves in the open.

BASAL RATIONS OF DOMESTIC FEEDSTUFFS

Many profitable items of information obtained in the earlier trial stages are omitted here in deference to the main results. It soon appears that the first requisite to successful experimental deer feeding was to establish a basal ration for maintenance purposes. This would furnish a common denominator for factoring or for comparison. Because it was necessary to base this on feeds of known nutritive value, domestic feedstuffs were used. Chemical analyses

of forages are very deceptive, and determining the nutritive values of the natives is a long-time problem.

Alfalfa hay was fed for the roughage. Equal parts of whole oats, whole shelled corn, and rolled barley composed the concentrate. Since the deer would under no circumstances eat the alfalfa stems, only the leaves were fed. The Morrison feeding standards were used, beginning with a sheep maintenance ration of 2 pounds per hundredweight. Originally a 60-day period was given to each trial, but deer respond so rapidly to changes in diet that 3 weeks proved long enough. A 10-day period followed each 21-day trial during which the animals all received the same treatment to bring them back to herd uniformity. Weighings were made on three successive days at the start of each period, and likewise at the end, the averages of which gave the beginning and final weights. Two weighings were also made each week. In addition a careful, daily inspection of the deer was made which often told as much or more than the scales.

In the base ration studies with domestic forages, 27 individual trials were run, exclusive of the exploratory work which had furnished the information as to the weights and kinds of feeds with which to begin a definite feeding schedule. In the first series of 2 pounds per hundredweight the ration consisted of 1 pound alfalfa leaves and 1 pound concentrate as mentioned. This proved insufficient and during the next period the 2-pound ratio was increased by 20 percent or up to 2.4 pounds per hundredweight. This allowance was more than was necessary, and since the weigh-back indicated only about a 10-percent increase, the figure 2.2 was used in the third series. This appeared to be the coefficient we were searching for, as the five individuals carried on this amount for 56 days reached the end of the period in excellent physical condition and vigor. Throughout the past year this is the ration used during holding periods and in every case it has proven satisfactory. The dependability of the results are further substantiated by the fact that four mule deer does produced eight fine, vigorous fawns weighing from 7 to 8¼ pounds a piece. Throughout breeding and pregnancy the does were carried on this ration plus an increase noted later. Since the time of John Dean Caton [3] it has been regarded as very diffiult to raise mule deer in confinement, yet these does, with the exception of a short weekly exercise allowed under observation, were confined singly in pens of only 300 square feet.

Five weeks after the does became pregnant they were returned to the straight 20-percent increase, the amount required for domestic sheep during this period. However, this again proved too much, and while the pregnancy rations are not definitely proven as yet the indications point toward about a 2.3-pound requirement. Probably the additional 10 percent needed for maintenance represents the nervous energy consumption in wild animals over tame, and the smaller increase necessary in pregnancy a better utilization by wild animals during this period. Does are quieter when carrying fawns.

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[3] Caton, J. D., the Antelope and Deer of America, Forest and Stream Publishing Co., New York, 1877, 2d ed., p. 1927.

NATIVE FORAGE STUDIES

After the maintenance figures on domestic feeds stood repeated trials without significant change, the studies were shifted to native forages. So many species and combinations were involved that the procedure and results will be merely outlined.

To date 67 species have been fed for either palatability or maintenance trials. Of these only 31 can be given a definite rating and value. The procedure used now in working with natives is to place before the deer a variety of species from which they can make free choice. At first the study was attempted by beginning the feeding with four or five species and adding more if the changed conditions of the animals called for it. This developed too complicated a system of data to allow dependable interpretation and also created an unnatural usage on any newly introduced forage that was palatable. Obviously all plants fed in the succulent stage were figured on an air-dry basis, and when it was found that any plant palatable in the green stage was as much so when properly air-dried a great simplification and dependability entered the work. Using air-dry forage, then, some 12 or 16 species are weighed and placed before the deer twice each day and the uneaten portions weighed back. Soon the record sheet for each deer began to show a picture both in the composite ration and for the individual plants. Some species showed a 100-percent use throughout, others less, while some will start with zero and end with 100 percent or vice versa. But when one forage loses in palatability, some other picks it up, and in the end the figures will be very close again to 2.2 pounds per hundredweight as was found for domestic feeds. The choice of ingredients in the mixed native ration is guided by field observations on the plants being seasonally taken by wild deer. Usually some mast or berry species are available and one or more of these enter into the mixed ration. Amounts of each species far above the possibility of 1 day's consumption are weighed in, and it often happens that some very palatable concentrate will be eaten to the exclusion of all else. In a short time, however, the animal's appetite will begin to taper off on this particular item and his consumption on other species will increase.

PALATABILITY AND SEASONAL USE OF NATIVE FORAGES

Against these weight studies a continual test is run on other individuals for palatability and seasonal use. This is fully as important a phase as the weight requirements, but is a long-time study to survey even the most important of the game food plants. Of interest are the findings on some of the plants considered important or negligible as deer forage. Cliff rose (*Cowania stansburiana*) and mountain mahogany (*Cercocarpus paucidentatus*), two rosaceous plants, have been considered extremely important elements on a deer range, yet their use and palatability falls far below dozens of other forages from the same vegetation type. *Garrya wrightii*, a dogwood, is also given a high use and palatability rating. Two years' tests with it, however, show it has about a 6 weeks' use in winter, and even during this time has mediocre value.

This species illustrates the importance of a knowledge of the seasonal use of game forages. If year-long use was assigned on a range with a high density of *Garrya*, it would create approximately an 88 percent error.

Grasses have been found, as observed by Dixon[4] in his work with the mule deer in California, to be of much more importance than generally recognized. In southern Arizona there are two periods of use corresponding to the early spring and late summer growth seasons when they are extensively grazed up to the time the plants begin to shoot the flower stalk. Grass cut during the time it is being grazed in the open and properly cured is acceptable to the deer at all times.

A few of the more important native trees which are browsed year long, and are highly palatable, are three live oaks (*Quercus oblongifolia*, *Quercus emoryi*, and *Quercus arizonica*), mulberry (*Morus microphylla*), hackberries (*Celtis reticulata* and *Celtis pallida*), and aspen (*Populus aurea*). Important shrubs are the *Eriogonums*, especially *Eriogonum wrightii*, which species might well lay claim to being the most important single forage plant for large game animals in Arizona. A native hydrangea, *Fendlera rupicola*, is much used; even the spiny-pointed seed pods are eaten until well into maturity by the deer. Mountain mahogany, although not as heavily utilized as other shrubs, has year long use and appears much more palatable than cliff rose. One of the mistletoes, *Phoradendron macrophyllum*, is an outstanding year long feed. Wild grape, *Vitis arizonica*, is also much used; both dry and green leaves are eaten and the berries are especially liked. Of great importance are many of the leguminous shrubs which are found widely distributed over most of the southern Arizona ranges. The following are particularly palatable, and are used throughout their foliage period: false mesquite, *Eysenhardtia orthocarpa*, sensitive plant, *Mimosa biuncifera*, false indigo, *Amorpha californica*, *Parosela formosa* and *Calliandra* species. Fruits of two species of cacti (*Opuntia engelmanii* and *Ferocactus wislizeni*) are also much sought after they have reached a certain sugar concentration. The prickly pear species matures in late summer, and the barrel species (*Ferocactus*) in early winter. A few of the ephemerals and weeds much liked are the portulacas, morning glory (*Ipomea* spp.), plantains, filaree (*Erodium cicutarium*), lambs quarter (*Chenopodium* spp.), and careless or pigweeds (*Amaranthus* spp.). The filaree is an introduced plant, brought into the State in early days by sheep and became one of the most important of all winter-forage species.

Weeds and other annuals are a foreage factor of infinite importance on the game range and management plans which ignore them will be far from reliable. Stomach analyses have probably led us somewhat astray in this respect, because these plants are mainly grazed when very succulent and are largely missed in any analysis. For example, a deer will eat 5 or 6 pounds of portulaca a day, and these plants break down so quickly and are so devoid of fiber that there is hardly 8 ounces of identifiable matter in the day's feeding.

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[4] Dixon, Jos. S., A Study of the Life History and Food Habits of Mule Deer in California. California Fish and Game. Sacramento, 1934, vol. 20, nos. 3 and 4, p. 109.

WATER CONSUMPTION

Water consumption depends on temperature, exercise, and the kind of forage the deer are eating. On air-dry feed in spring and fall it closely approximates a quart and one-half per day for a 100-pound animal. Succulent feeds, as the portulacas, will decrease this amount by one-half or more. More feeding is done in the evening than in the morning, the ratio being as 7 is to 5. We are now attempting to work out growth, fattening, and pregnancy rations. It is hoped three young animals which have been fed and recorded from birth can be carried to maturity or breeding age, and the actual total forage pounds required to produce an adult deer can be learned with fair accuracy.

Many items of information on the deer were obtained incidentally to the experimental feeding work. The gestation period of four mule-deer does was individually 193, 200, 202, and 203 days. The white-tailed records were lost, but were very nearly the same length of time. The climatic period occurred every 20 or 21 days for these mule-deer females in the breeding season, and never lasted over 36 hours.

In the late summer of 1935 a serious disease became established in deer herd. The organism was the common blue-green pus former, *Bacillus pyocyaneus*, now known as *Pseudomonas aeruginosa.* Seven out of ten fawns died of it. Blood tests made on several of the females showed the organism present in the blood stream, but the adult animals were resistent to it. The fawns died within a week to 10 days after they first showed outward symptoms of being sick. The entire alimentary tract and vascular system were involved. Post-mortem examinations showed heavy infections in the stomach, intestines, kidneys and the pericardial sac, with a generalized septicaemia. Necrotic foci were found in all posted cases in the sublingual glands. Summer rains usually begin by mid-July but the past summer they did not start until late August. Shortly after the rains had flushed the canyons the disease abated and has not troubled since although several young fawns were added to the herd in late August. Considerable data have been collected to indicate this condition existed in the wild deer in the Santa Ritas and adjoining ranges.

The mule-deer fawns gained slightly over one-half pound per day, weighing 90 pounds at the end of 5 months. The white-tail fawns gained very close to one-third pound per day. At 4 years of age two mule-deer bucks weighed 225 each, and four does, respectively, 138, 131, 120, and 116 pounds. The 116-pound individual has always been very nervous, food frequently lodges in the gullet just forward the entrance into the thoracic cavity. Relief is obtained by massaging the material downward. Bucks drop off rapidly during the rut whether they are breeding or not. One animal dropped from 225 to 207 pounds in 8 days. Does were found to drop from 4.5 to 9.0 pounds in addition to the weight of the young at the fawning period.

To date we feel we can say with reasonable assurance that either mule deer or Arizona white-tail require 2.2 pounds of air-dry feed per day per hundred pounds in order to maintain their bodily weight and vigor. On breeding does this figure will possibly be raised to

2.3 during 260 days out of the year. This allows 60 days for heavy nursing in addition to the gestation period. Since the palatability and seasonal-use studies must be figured on the basis of yearly units, the limited data now available do not justify definite statements. Its greatest value so far has been in pointing out a caution against erecting game and wildlife management plans on traditions and theories—and the need of getting into the field with old clothes on to do some hard hunting for plain simple facts.

DISCUSSION

Mr. VERNON BAILEY (Washington). Do you make any experiments with the native deer of that area? Kaibab deer come from other parts. Are there any native animals?

Mr. NICHOL. We would like to make such experiments. They are not all gone. We hope to add these to our experiments. We recognize the error. In fact, we have made several long trips to get aspen and yellow pine. I might say when on coniferous food they will go down. If we hang up pine, juniper, or spruce, they will not look at it, but maybe the next day it will be cleaned. Then again it may be 2 weeks before they take it. Do not know whether or not it is due to something additional in the way of a condiment in it that they do not like it.

Mr. DIXON (California). Have you found any evidence that mistletoe causes abortion in sheep? Mistletoe is found equal in palatability to poor alfalfa hay.

Mr. NICHOL. Throughout the whole last period we fed deer on mistletoe. It is a distinct deer food in our country. Weeds should carry much weight on game ranges. Live oaks are good for yearlong uses.

Mr. JOHNSON (California). How do animals in confinement compare to those in the wild as to quality of antlers, and so forth?

Mr. NICHOL. Produce as good set of antlers on bucks. In Germany the best deer produced was in a back yard. We use one buck to four mule deer.

FOREST-CARRYING CAPACITY AND FOOD PROBLEMS OF DEER

(By HENRY E. CLEPPER, Pennsylvania Department of Forests and Waters)

At the outset it should be explained that this paper is not an attempt to deal summarily with the two problems postulated in its title. Almost nothing definite or conclusive is known in the United States about the forest-carrying capacity of deer, and very little, it must be admitted, concerning the solution of their food problems. That these problems are now recognized to exist and that they constitute an unavoidable challenge to the ingenuity and resourcefulness of conservationists generally, and of foresters, biologists, and game managers in particular, are the only two points about which we have any certainty. Consequently, it appears to be incumbent on the present writer not to restate an old problem, but rather to assist in pointing the way toward those efforts that promise most effective and immediate results in meeting the issue of how to regulate our forests in order to provide optimum conditions for

the maintenance of a maximum deer population not inconsistent with approved forest practice.

Furthermore, the writer, at the expense of eliminating numerous impressive references to this subject, will assume that those to whom the paper is addressed are familiar, or at least acquainted, with the studies and literature already available, and he will, accordingly, confine his attention to future needs rather than past performances. Note, in passing, that the word "studies" has been used advisably. We are still in the experimental stages of wildlife management. The actual accomplishments in the realm of silviculture to improve deer habitats, except insofar as certain improvements have occurred perhaps more by accident than from design, are entirely too sketchy and localized to have more than a very restricted effect.

In addition, reluctant as those of us who are foresters may be inclined to do so, we are constrained to admit that our silvicultural practices have, until a few years ago, been directed almost wholly to stand improvement for timber production; there has been little or no deliberate activity with ax and crosscut saw to amend deer habitats. And it is, furthermore, a naive belief that all foresters generally have changed their practices to improve the deer-carrying capacities of their forests. For many foresters secretly, if not openly, would prefer a minimum deer population because of the obstacle deer present to extensive and successful reforestation. Perhaps it would have been advisable to let this phase of the matter go unmentioned, but the writer holds that our forestry contributions to a solution of the deer problem will be useful only in proportion to our ability to recognize our responsibility and not fool ourselves.

Certainly, deer are a liability on some forests. Certainly, they may constitute an almost unsurmountable obstacle to reforestation. Certainly, under some circumstances they are a pest of the worst kind. But the answer to those situations is not elimination but regulation.

In 1929 the present writer was assigned by the department of forests and waters to study this subject of forest-carrying capacity and food. Two years later he made a report which was published as Bulletin 50, The Deer Problem in the Forests of Pennsylvania. In this bulletin he listed 111 plants actually observed to be eaten by deer. Since that time the list has been enlarged by additional observation, but the new information merely served to strengthen the earlier conclusion "that practically all the common trees and shrubs of Pennsylvania were observed to have been browsed by deer."

The point to be made is that considerable time and money were spent to establish that fact. We know that some foods apparently are more palatable than others, but we do not know which plants provide the most nourishment. We know that to exist over the winter, deer appear to be able to subsist on a minimum of nourishing foods, but we do not know what that minimum is. We know, on the other hand, that a bountiful and varied food supply on a given tract will carry a larger herd than a limited supply, but we do not know how much land will carry how many deer. In short, we are handicapped by a lack of essential knowledge.

European experience does not help us; forest conditions there and here are too diverse. In some parts of France the limit is ten roe

deer to 250 acres. In Germany the foresters permit from 8 to 16 red deer, with young, on 2,500 acres. The world-famous German forester, Dr. C. A. Schenk, early suggested a limit of 150 Virginia deer on 10,000 acres in the southern Appalachian forests. Another authority states that 750 acres of northern Michigan forest can support 100 deer.

Interesting as they are, those figures are at the best only guide posts to show us the way. Let it be repeated, we simply do not know. It is the present writer's guess that the second-growth, cut-over, hardwood forests that characterize so much of our woodlands in the Northe astern United States are capable of supporting, and do support, as many as one deer to each 15 to 25 acres. That the population is too high, however, is attested annually by the large numbers of deer that are found dead, apparently from malnutrition.

In northern Pennsylvania more than 900 dead deer have been reported last year. Such a condition is to be deplored, yet it is no new thing. Vernon Bailey in 1928 reported a thousand dead yearlings in four Clearfield County townships. It would be interesting to know definitely how many deer die annually, presumably from malnutrition, in a well-stocked game State such as Pennsylvania, but the knowledge would not greatly help us in the solution of the food and cover problem. Neither do the periodic open-doe seasons solve it.

Some sportsmen were heard to say that the deer population in Pennsylvania would not recover in 10 years from the effects of the first general open-doe season in 1931, yet at the present writing it is impossible to carry on reforestation in several State forests in northern and central Pennsylvania because of the destruction by the deer.

We are faced with the fact of overpopulation in some regions and underpopulation in others. And the present writer respectfully suggests that the most practicable and scientific approach to the problem is by research studies designed not to remedy periodically an intolerable situation, but to control or prevent it in its inception.

Among other information required is a determination of "how many deer eat how much of what?" Now, such information is not easy to come by. To obtain it, trained men and considerable money are needed. It is a remarkable commentary that whereas in most States public support and public funds can be acquired without much difficulty for policing game, for propagation, and for the acquisition of game lands, only a pittance is usually appropriated for research.

Specifically, the present writer believes that a number of judiciously selected experimental deer-food plots, say, 10 to 15 for each of our major forest types, would tell us much regarding the carrying capacity of our forest stands. To illustrate the kind of experimental plot contemplated, let me briefly describe one projected for the spring of 1936 in the Mont Alto State Forest in south-central Pennsylvania.

The 25,000-acre Mont Alto State Forest was acquired by the Commonwealth of Pennsylvania in 1902 and has been managed on a sustained yield basis for over 30 years. It is the demonstration

forest for Pennsylvania forestry and serves as a proving ground where many of the State's forest practices are initiated and tested. A branch office of the division of research is maintained there and includes on its staff a forester experienced by training and avocation in game management.

The experiment is to be carried on as a cooperative project between the board of game commissioners and the department of forests and waters. A 25- to 50-acre area has been selected and will be enclosed by a deer-proof fence. The shrub and tree growth will be carefully inventoried and mapped. Several deer, probably four or five, will be turned loose in the plot and will be expected to subsist wholly on the vegetation found therein. Observations and records will be made of the species eaten by the deer, particularly as to the preferences shown and the relative quantities taken. It is further proposed to have chemical analyses made of the vegetal species eaten to determine their food value.

In brief, it will be seen that experiments of this sort will provide information on the plant species, together with their food values, preferred by deer. Furthermore, they should give more accurate knowledge than we have ever before been able to obtain about the carrying capacity of the stand.

Another phase of the problem that affords possibilities for valuable research is in the field of silvicultural practice designed to increase deer food and cover, as well as timber production. To illustrate: A series of improvement cutting plots has been established in the Mont Alto State Forest in various types of growth from cove to lower-slope and upper-slope conditions. The plots have been given degrees of thinning from light to medium to heavy. Complete and careful inventories have been made of the vegetal species present, including their location and abundance. The object is to determine what degree of thinning for each class of timber stocking will provide a maximum of food and cover plants in the understory without sacrificing wood increment.

The importance of this silvicultural experiment may be understood in view of the extensive improvement cutting operations now in progress by C. C. C. workers as part of the Emergency Conservation Work program. The question has frequently been raised during the past three years—ever since, in fact, the inception of the Civilian Conservation Corps—as to whether these extensive, so-called improvement cuttings may not remove sufficient food and cover vegetation to cause a serious shortage in the amount available for deer.

It must be admitted that in some instances the removal of the understory of shrubs and vines has done that very thing. That such forms of forest cleaning are unjustified, if for no other reason than that they are not in accordance with approved forest practice, is a valid criticism of the program. Fortunately, in Pennsylvania at least, these cleanings have been stopped and the improvement cuttings now being carried on are designed to favor the vegetal species providing food and cover. Furthermore, the work is closely supervised by a forester experienced in thinning operations who works out of the Harrisburg office of the division of research.

Now, it does no good for foresters to resent criticism of forestry practices from the public, sportsmen's associations particularly. The

layman is not in a position to distinguish between a cleaning which removes valuable deer food species and an improvement cutting designed to favor them. The fact that some of the earlier woods activities of the C. C. C. did actually remove food and cover species is still resented by sportsmen's bodies, many of whom are not yet convinced that the program has been set right.

Perhaps it might be well at this point to explain briefly how and why the improvement cutting operations now being conducted in the Pennsylvania State forests promise more bountiful supplies of available food and cover than are supplied by the untreated forest. Forestry practice, when skillfully directed, does unquestionably have a beneficial effect on the food supply of game. Let us see why.

When timber stands are fully stocked and attain pole-wood size, the crowns on the trees form a roof of foliage which, as it grows denser, permits less and less direct sunlight to reach the understory of vegetation. Consequently, most of the small growth is shaded out, except the species most tolerant to shade, such as Taxus and a few others. But it is this small shrubby and seedling growth which is within reach of the deer and which forms their principal food supply. When it disappears as a result of combined browsing and shading, the game goes on short rations and starvation may ensue. This condition is not a theoretical conclusion of cause and effect, but an actual reality, as witness the extensive areas of woodland in Pike and other northern tier counties of Pennsylvania where the so-called deer line is a curious and portentious indication of to what extent the deer herd has literally eaten itself out of house and home.

Judicious improvement cuttings can unquestionably correct that evil. But to make them most effective the practicing forester needs the guidance of a technique that will show how as well as why to axe-treat the forest.

According to Prof. Geo. S. Perry, improvement cutting increases the deer food on an area for at least 5 or 6 years and very notably for the first 3 seasons. The next sprout growth, following successive browsing, becomes much branched and forms a dense cover, when, after 6 or 7 years, it finally grows beyond the reach of the deer.

The tenderness of the shoots that spring up after cutting is not the only reason why game seek these areas. When forest land is left to grow up untended by man, especially if in the past it was abused by fire and clear cutting of all the better trees, so that laurel, scrub oak, sweet fern, huckleberries, witch hazel, and sour gum tend to take possession, the soil and living vegetation become more and more acid with passing years and for some decades at least.

Nearly all the mineral salts are absorbed and held, locked up, in the leaf litter and humus on the forest floor. But if a certain amount of cutting can be done now and then—say, every 8 or 10 years—the rays of the sun combine with decaying brush and tramping or stirring of the litter to stimulate more complete decomposition of the organic matter.

This multiplies all kinds of minute life in the forest soil and humus; mineral salts are liberated, and are in turn absorbed by growing plants and trees; and game find their leaves much more palatable and attractive than the same kind in undisturbed woods.

European forest practice, which, it must be remembered, dates back some 300 years, whereas ours in this country is barely one-

tenth as old, has proved the worth of this procedure to improve game conditions. There it has long been known that mixed forests of hardwoods and evergreens always favor big game such as deer, bear, and wild boar. The increased fruiting or seeding of trees as a result of thinning and selection cutting is very important. Dense, crowded stands of trees yield little or no seed, but thinned stands produce frequent and abundant crops, which attract and support all forms of wildlife.

It is the writer's conviction, which is supported by that of other foresters both in administrative and research work, that orderly and planned improvement cutting will unquestionably accomplish two desirable results: (1) It will permit an increase up to 50 percent of deer on all areas where the herd is not already grossly overstocked; and (2) it will permit better nourished herds than the untreated forest can ever support.

Since the spring of 1933 some 65,000 acres of Pennsylvania State forest have been cleared of dead and inferior trees and worthless weedy shrubs. Primarily the work was initiated to benefit the timber trees, especially plantations; later its scope was enlarged to favor game food and cover species. Most of the areas treated were adjacent to highways or good forest roads. The sprout growth that has come up since these cuttings is positively luxuriant in its profusion.

On these areas gum, soft maple, aspen, elm, beech, and birch sprouts, even scrub oak, appear to be the preferred food. However, practically all kinds of woody and herbaceous sprouts are nibbled more or less in their tender stages. During the winter months when the work was at its height, deer frequented the cutting areas in unusually large numbers to browse on the buds and twigs of the limbs and tops that had been cut off and scattered when the trees were felled. The success of this type of cutting, especially in providing food for the winter and early spring months, strongly recommends itself as a permanent activity in the management of publicly owned forests.

DISCUSSION

Mr. Duthie (Washington). Have these observation studies been completed? Is there a period of the year when certain species are taken and other times when they vary their food?

Mr. Clepper. I cannot say as I am only presenting this paper from a forester's point of view. Do not know biological facts about deer.

Mr. Gerstell (Pennsylvania). It was noted in the State there is a certain preference but we have no experiments as the study begins this spring.

Mr. Bailey. Problem in Pennsylvania is only a winter food problem. Food of every kind in the mountains in summer. Snow stays on south slopes too long and is too deep for the deer to wade in. What you want is a supply of winter food as winter species are killed out.

Mr. Gerstell. Food supply in Pike county has extended into a summer problem and in fact is a year-round problem.

Mr. McKinley (Kentucky). Is there no way to treat rare plantings in areas where there are deer to make them disliked by the deer?

Mr. Clepper. We have literature on the subject and I will be glad to furnish you with it.

Mr. Trippensee (Massachusetts). Have you convinced your public of the effects of overproduction?

Mr. Clepper. Now you have me. No doubt, if I had the information I would keep it from you. Some of us in Pennsylvania have adopted principles to aid game as well as timber management. We have conditions where overproduction is a problem and there are places where there are no deer and we want to build it up

The Minnesota Caribou Herd

(By Gustav Swanson, Minnesota Conservation Department)

The most graphic way in which we can bring to the public the needs of wildlife is to call to its attention those species, which because of man's lack of foresight, have become extinct or are nearing extinction. No conservationist's plea for action is complete until he has recited the tragic story of the passenger pigeon, the great auk, the Labrador duck, the Eskimo curlew, the California condor, and the heath hen, to cite a mere half dozen of the many species which have passed, or are rapidly passing, from our picture. My purpose is to bring to your attention just one more species which we may properly add to this list.

In primitive time thousands of caribou inhabited the area now occupied by the northeastern part of the United States. In the United States at present these animals are limited to the minutest fraction of their former range, and their numbers are represented by a remnant which only the most optimistic can believe will survive.

The woodland caribou, of which I am speaking, does not fall into the same category with the vanishing species mentioned previously. Canada still has rather large numbers in its limitless uninhabited wilderness areas, but the United States has within its boundaries only one small herd, which has been so reduced in size that our most elaborate efforts to save it may prove unavailing.

The area in which this caribou herd is found is a portion of the Red Lake Game Refuge in northern Minnesota. This refuge includes over 400,000 acres of land which is practically worthless, not only to the agriculturist, but to the forester. To the game conservationist, however, it is of vital interest for, in addition to the caribou, it supports substantial populations of deer, moose, bear, beaver, lynx, and even a few fisher.

The center of the Red Lake Game Refuge is an enormous muskeg bog which favors the caribou and accounts for their very existence in Minnesota today. As long as they remain in this bog they are practically undisturbed by man, because it is inaccessible except to those individuals willing to travel afoot for many miles of difficult hiking. With this circumstance in mind we must consider the habits of the caribou and their relation to other animals in the refuge to understand their decrease to the present point of scarcity.

The point of greatest interest in this presentation, however, is that the number of caribou now remaining in the Red Lake Game Refuge

is probably not greater than eight individuals. It is impossible to make a definite statement of the size of the herd, because the animals which comprise it do not remain in one group, and they are difficult to find. The range to which they generally confine themselves is roughly 8 miles long and 5 miles wide. In an area of this size less than a dozen caribou are rather difficult to find, and we must base our estimate of the size upon the observations of the resident warden-trapper. We have definite evidence, from sight records and trailing observations, that there are at least six caribou in the refuge. As far as I know, no observer in the past 2 years has found even the trail of a larger group than five individuals. This is in marked contrast to the situation a few years ago. As recently as 1927 a reliable observer counted 27 caribou in one herd.

With the picture in mind of the pitiful remnant to which the herd has declined, the observer logically asks for an explanation of the decrease. Field observations have been too few to offer a satisfactory picture, but a review of the possibilities may not be amiss despite this lack.

First of all, we know that the legal protection from shooting which has apparently been so efficacious in bringing back the numbers of wood ducks from what seemed to be a precariously low population, has utterly failed in the case of the woodland caribou. The protection which has been extended for several decades has not succeeded in checking the decline. The explanation lies elsewhere.

I fear, however, that illegal shooting of big game in the Red Lake Game Refuge is a factor of no small proportions. The refuge is fringed with the habitations of dozens of settlers who are eking out the barest sort of existence on soil which the Lord never intended should raise a crop of anything except wild animals.

For the most part the caribou remain within the limited range which I have mentioned previously, but occasionally they have been known to wander many miles in any direction from the big bog in which they are safest, and at these times they expose themselves to the danger of succumbing to a frontiersman's appetite for fresh meat. When it is pointed out, furthermore, that a large Indian reservation directly adjoins the game refuge the danger from illegal shooting which the caribou face is more easily realized. When the caribou wander a scant dozen miles southwest of their usual range they are in the heart of the Indian hunting grounds, and they have been found just there within the past 2 years.

It is only fair to admit that we have no definite records of caribou taken by hunters legally or illegally in the past several years, but the territory in question is so difficult to patrol that detection of law violations is certainly the exception rather than the rule.

There is only one other factor which seems at all important in the loss of the caribou, and that is the only predator of importance to the caribou, namely the wolf. There is a fairly high population of wolves in the refuge if sign can be relied upon as an indication. Most of these are brush wolves, but a considerable number are the larger timber wolves, recognized killers of big game. In areas with a normal big game population the wolves are undoubtedly of value in culling the unfit and I would be the last to encourage their

persecution without the previous accumulation of much pertinent information. In this area, however, every loss, whether it be to wolves or otherwise, is of such importance that I believe we are justified in taking every possible step to avoid it. For several years we have had records of calves born, but despite the reproduction the herd has continually decreased. The suspicion that wolves played a part in the losses was at least partially substantiated on a trip last November when the remains of a calf of the preceding spring were found, almost entirely devoured by wolves. An isolated observation such as this proves very little, but it does indicate that wolves are a part of our problem. Such observers as Vernon Bailey and C. M. Aldous, of the Biological Survey, have also suggested after trips into the caribou bog in Minnesota that wolves were probably one limiting factor.

After this discussion of the causes of losses it is only reasonable to mention methods of controlling them. The only solution to the problem of the wolves is to destroy them. A state warden-trapper spends his time in trapping wolves on the refuge, and he works in the caribou range most intensively. This winter he has taken 14 wolves to date with the best part of the season yet before him. Last winter he worked for a relatively short time and took 17 wolves. This winter rabbits are notably scarce in the area, and little is left as food but the big game, so control of the wolves seems especially necessary.

Control of illegal shooting is just as difficult as control of the wolves. The only real answer seems to be removal of all settlers from the refuge, and we hope that the Resettlement Administration will accomplish this for us now that the refuge falls within one of their projects. To save the animals from wandering into the Indian reservation where they would be in constant danger, the only suggestion thus far has been the construction of a game fence along the boundary. Such a fence would need to be 16 to 22 miles long to care for the problem, and seems too expensive for the State to undertake alone. A W. P. A. project for such a fence has been approved in part, however, and we are living in the hope that it will be completed at an early date. As yet work has not begun on it. If such a fence is constructed it will save much big game besides caribou, because many deer and moose will be prevented from wandering away from the refuge.

Our brightest rays of hope in the problem of saving these caribou fall from the general direction of the Federal Resettlement Administration. This agency hopes not only to resettle the present residents on land more suitable for human habitation, but it hopes to utilize the land thus vacated for the best purpose possible. In most of the Red Lake Game Refuge that purpose is certainly the raising of game, and a most important species is the caribou. In attempting to lay out a logical management plan for these caribou the Resettlement Administration, under the direction of its forester Mr. W. T. Cox, and game manager Mr. F. S. Henika, is attempting to do something which should have been done years ago, namely, to study the problem thoroughly. Accordingly, two men will spend several weeks in the caribou range doing nothing but study the problem in all of its phases. Upon the findings of these men this winter will depend the success or failure of any attempt to save

this last herd of Woodland caribou in the United States from extinction.

Mr. JACKSON. We all wish for the success of this herd as it is the only one remaining in the United States and we must save it. Not only is the caribou exterminated in the United States, but in eastern Canada, where, up to the past few years, they had been more abundent.

Mr. BAILEY. Cannot have coyotes and wolves on same ground. Takes money, but they can be cleaned out.

FOREST MANAGEMENT AND WILDLIFE MANAGEMENT

(By W. L. MCATEE, U. S. Biological Survey)

My paper is not a criticism of any individual or institution or organization. I believe we have signed a truce with the Forest Service that neither will criticize the other publicly. I was inspired to write the paper by personal experiences that seem to show forestry practices are not for the best interests of forests for game and wildlife. Inspiration for this paper came from observations in Pennsylvania.

Experience indicates that difficulties are likely to arise in combining forest management and wildlife management on the same area. It should be brought home to the personnel involved that these difficulties trace back to the almost opposite requirements for maximum production of timber on the one hand, and of wildlife on the other, so far as manipulation of the vegetative cover is concerned. Acceptance of this fundamental distinction should help foresters and wildlife managers in deciding in any given case whether the modifications of their respective ideals necessary to harmonious cooperation are feasible, or whether it is better "to agree to disagree" and plan for substantial or complete separation of their spheres of activity.

To illustrate, foresters have accepted practices that are sincerely designed for stand improvement, but which are anything but improvement for wildlife. Consider, for example, elimination of "weed trees", that is, species not desirable in view of the prospective market for others at a given time and place. As currently interpreted in New England (according to observations of J. Paul Miller and the writer) weed trees may include any or all of the birches, aspen, elm, beech, oaks, cherries, mountain ash, shadbush, apple, hawthorn, maples, and ashes. This list embraces the best browse and budding trees (apple, spen, birch, maple) of the region, the most important mast producers (beech, oaks), the earliest tree fruit (shadbush) to mature, and one of the best for hanging over winter (mountain ash). Seedling apples are probably the best all-around wildlife feeders of the region; the cherries are valuable fruit yielders; elm provides seeds for small birds, and in low growth, browse; maple seeds are a good wild food produced in quantity and the striped maple is especially favored as browse. Elimination of such species as these certainly does not improve woodland for wildlife. The plants named are discouraged to make conditions better for spruce and pine, trees furnishing desirable cover when in scattered clumps (not so desirable in extensive dense stands), and occasional crops of seeds that are good food. On the whole, however, they are

of distinctly less utility to wildlife than are the species often removed to favor conifers.

In the southern bottom-land hardwood forests, species "to be removed always if competing with desirable trees" are hawthorn, ironwood, Hercules' club, swamp privet, and planer tree. Hawthorns are good fruit-bearers and some species retain the haws over a long season; ironwood is good for seeds, buds, and browse; Hercules' club for fruit and browse; and swamp privet and planer tree are the best producers of fruit and mast, respectively, that occur in southeastern swamps.

There is a list of 12 species "to be discriminated against unless particularly good" and of 18 species or groups of species "to be tolerated if of good quality", leaving only 10 species or groups out of a total of 45 "to be definitely favored" (5). Regardless of the differential value of these trees for wildlife, reduction in variety of the stand alone is sure to be inimical in diminishing opportunities for specialized feeders, in impoverishing dietary resources at certain seasons, and in lessening the total quantity of food.

For the Southern Appalachian region, trees classed as "least desirable" include some of outstanding value for wildlife as persimmon, serviceberry, crab apple, hawthorns, mountain ash, chestnut, chinquapin, and striped maple. Among "weed trees" are the no less valuable sassafras, dogwood, and pin cherry, and 22 species or groups of species are listed among shrubs and vines "that sometimes interfere with reproduction of desirable tree species" (1). Among them blackberry, raspberry, and elderberry are fruits most frequently consumed by birds, and the list includes also blueberry, huckleberry, grape, and Virginia creeper, all of which are of more than ordinary value. Good browse species as alder, Jersey tea, sweetfern, and striped maple also are proscribed. In the Ozark region, "Red maple, black gum, hickory on poor sites, post oak, blackjack oak, and ironwood are distinctly weed species" (2). All of these are of value to wildlife. The point need be labored no further, however, for it is fully evident that stand improvement by differential treatment of species is inimical to wildlife not only through elimination of plants of particular value but also through decrease in diversification of woodland growth.

Diversification as here used refers to maintenance of a large variety of species. There is another sort of diversification, namely, in age classes also important to wildlife that foresters achieve in selective cutting operations. As has been suggested by Ira N. Gabrielson, Chief of the Biological Survey, if foresters will distribute selective cutting blocks as widely as practicable through forested areas, they will greatly increase favorable environment for wildlife.

A practice of foresters, other than weeding that is not for the good of wildlife, is striving for a closed canopy. All of us have seen stands of coniferous trees so closely set as to exclude most of the light, and the ground beneath covered with a thick bed of needles in which practically nothing grows. Ward Shepard writing of spruce stands in the German State Forests says, "These forests are extraordinarily dense and dark, so that at an early age (about 15 to 20 years) all undergrowth of every kind—both shrubs and herbaceous plants—is pretty well killed out by the shade" (4, p. 6). It is

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Bear approaches its den in a tree in the Monongahela National Forest, W. Va. (Forest Service photo.)

292512

A, Series of water deflectors built by C. C. C. workers in a stream in Deerlodge National Forest, Mont. (Forest Service photo.)

306307

B, Rock spill dams built in Pennsylvania State Forest by C. C. C. workers for better fishing. (Forest Service photo.)

not so well understood, but it is true, nevertheless, that mature deciduous forest has much the same effect, crowding out all but a spring flora and a few shade tolerant species. All depends upon the amount of light reaching the ground, and when it is reduced beyond a certain point the understory practically disappears.

It should be pointed out, however, that we have certain types of forest as the yellow (ponderosa) pine of the west and the longleaf of the southeast that are quite open at maturity and do not then suppress the ground vegetation so essential to wildlife. In the mature stages of such forests, and it may be for three-fourths of the lifetime of the trees, it is possible to combine highly productive forestry and wildlife management, and it should be done.

In the case of trees, either ever green or deciduous, that make dense stands, ground vegetation, in the natural course of events, is largely suppressed or even almost entirely disappears. With it disappears terrestrial wildlife dependent for shelter and subsistence on cover and food plants that can thrive only in good light. These plants grow along forest margins or in openings and abound on recently cut-over or burned areas. Birds flock to burns almost before they are cool. Rodents promptly invade them and larger animals soon follow, even if wildlife was evicted or extirpated by the fire. Fire not only makes formerly inaccessible food supplies available, but it seems to prepare myriads of dormant seeds for germination, and exposing them to full light, usually is quickly followed by a growth of vegetation unsurpassed for variety and luxuriance. For a period the area hums with insects in season, attracts small birds in unwonted numbers, and draws in every form of wildlife favored by its excellent refuge cover and abundance of food. All goes well in these respects until some of the plants begin to shade out others and the tree species make height growth that carries them out of reach of the browsers. Conditions very favorable for wildlife are thus made less favorable and by continuation of the process at last become distinctly unfavorable. The case is much the same on cut-over lands or in slashings except that in these instances there is not such pronounced initial stimulation of all kinds of growth as there is following fire. Thus it seems that the value of lands in wooded regions for wildlife is about in direct proportion to their lack of value from a forestry point of view.

To give forested land its maximum value, foresters justifiably strive for the closed canopy, and in the process of stand improvement, they have, moreover, every right to discriminate as to degree of utility between tree species and follow a policy of preferential treatment, on areas, the primary function of which is the production of timber. This is a situation wildlife managers must recognize.

It must further be recognized that wildlife cannot be encouraged indefinitely on forests for a very good reason, namely, that it may become seriously destructive. Damage may include harvesting too great a share of seed crops, rifling of seedbeds, and devouring of transplants. Bark is sometimes rubbed or scratched off and in other cases eaten. Browsing may often develop into overbrowsing and is a factor that if permitted to continue can lead, in the long run, through suppression of reproduction, to actual extirpation of forest growth.

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The forester must look after his own, but the same is true of the wildlife manager. As a beginning of his philosophy, the wildlife manager should recall that wildlife including notably valuable species inhabits desert, prairie, and beach lands, and marshes both fresh and salt, as well as bodies of water of almost every size, areas with which forestry, as such, has little or nothing to do. Most waterfowl refuges and a large part of the small game research or demonstrational areas give the wildlife manager free scope for development of his art. On areas where forests are definitely involved, he can use the suggestions of the present paper as to irreducible forestry technique as an aid in deciding what course in each case best befits the time, the place, and the problem.

The American public has long been thoroughly impressed with the idea of forest conservation. It is one of our established national principals and rightly so. Almost as completely the public regards forest areas "as the conservators of wildlife and the source of game animals and fish" (3).

As has been shown in the preceding discussion, however, stand improvement practice steadily diminishes the value of forests for wildlife and maintenance of the closed canopy virtually destroys it. This is so obviously the case that authorities freely assert that the interior of a dense forest is practically barren of wildlife. The reputation of our forest reserves as wildlife producers is really due chiefly to their unforested portions, to open glades and parks, to brushlands and slashings, to cut-over tracts, and to burns. When, therefore, we speak of forested areas as the home and creative center of wildlife, we are using a figure of speech and we could more literally and truthfully say that they are the conservators and the source of wildlife about in proportion to their departure from the standards of an ideal forest. Departing from those standards is a necessity for attaining any considerable degree of coordination with worthwhile policies of wildlife management. In this country, forestry, and its practices are established while real wildlife management is an innovation. Necessarily, therefore, concessions essential to good coordination of forestry and wildlife management must come from the forestry side. The fact certainly is clear that if we sincerely wish to favor wildlife in forest reserves, we must curb the universal growth of trees, we must preserve openings of varied types, and liberally foster brushland vegetation.

Immediately looms the spector of "highest use" and if that use irrevocably is decided to be timber production, then we must seek other areas for wildlife production. Forests and foresters must be supplemented by coverts and keepers. Where the production of wildlife is accepted as the primary objective, it is futile, nay it is fatal, to adopt standard forestry practices, as in the long run they do not favor, but on the contrary definitely discourage, wildlife populations.

Many, probably most, foresters desire to favor wildlife so far as may be practicable, but both forest growth and forestry practice of the first class limit their opportunities. In fact wildlife must ever be a byproduct on areas primarily devoted to growing timber. It is well for wildlife managers to take these facts into consideration and make necessary allowances. On the other hand when in charge of projects, the prime purpose of which is wildlife production, they

should avoid trying to combine forest and wildlife management, but forestry precepts to the contrary nothwithstanding, they should firmly put into practice any and all policies necessary for the highest welfare of wildlife. It is to be hoped that such ranges will increase rapidly in number and area so that wildlife shall at last receive the recognition so desperately needed and to which for a long time it has been fully entitled.

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DISCUSSION

Mr. Hopkins (Washington). I am familiar with the policies and practices of timber management and wildlife on the northeastern forests. We feel from our experience to date we can very successfully correlate the objectives of the two activities. Timber stand improvement work on most every eastern forest has a staff assistant in charge of timber and wildlife. Policies and practices are brought up and passed on by both men, each from his respective angle, before coming to an agreement and before submitting to the supervisor. In no case have we had disagreement. The question is whether clear cutting will make sufficient acreage for browse rather than selective cutting. It is our experience that we can correlate timber management and wildlife management on national forest areas, taking care of silvicultural practices in some cases and wildlife sustained yield in others, and put the two together and come out with desirable results from standpoint of managing the national forest in a way that will give the most desirable results to the public.

Mr. Edminster of New York. What is minimum of size in a clear-cutting operation?

Mr. Hopkins. Depends on product you are cutting. Hardwood distillation, you can cut to small area as 10 acres. Sawtimber will be, maybe, 250 acres. Depend on question of accessibility. More accessible area you have to cut, the less volume you have to get.

Mr. Edminster. To cut for chemicals do you cut small sizes?

Mr. Hopkins. That is what you find in hardwood distillation. Take Gray Chemical Co. operation, which cuts 5 and 10 acres with small amount of slashings.

Mr. ———. Has Forest Service any nursery planned for game-food plants?

Mr. Hopkins. We have started one this summer. A small nursery on the Allegheny Forest. Also part of nursery at Parsons is on an experimental basis. Not enough food to amount to anything until experimented with longer.

Mr. SIMMS of Washington. Want to correct a statement of McAtee. I would not want anyone to get the impression that game food has been eliminated from areas for timber management in the southern Appalachians.

Mr. DUTHIE of Washington. McAtee brings out point that burned-over forests produce higher type of game management rather than cut-over. Why is it? Is it account of mineral salts or account of game food left, in the way of seeds?

Mr. MCATEE. Cannot say, unless fire prepares seed for germination. The same process is not in cut-over.

CANADA'S REINDEER EXPERIMENT

(Prepared at the direction of Hon. T. A. CRERAR, Minister of the Interior, Canada. Presented by R. H. G. BONNYCASTLE, Hudson's Bay Co.)

The driving of a herd of reindeer from the west coast of Alaska for 1,600 miles along the Arctic rim of the continent and the establishment of the deer on a selected area near Kittigazuit east of the delta of the Mackenzie River in the Northwest Territories of Canada, constitute an achievement unique in the history of this continent. The great drive which began in December 1929, was brought to a successful conclusion on March 6, 1935, more than 5 years later when delivery was accepted by officials of the Dominion Department of the Interior. The inspection and counting of the reindeer showed that there were 2,370 animals in the herd, made up as follows: 1,498 females, all ages; 289 bulls and yearlings; 322 male fawns; and 261 steers. After the long trek it was gratifying to departmental officials to note the high percentage of female animals (namely, 63 percent) which augured well for the future growth of the herd.

The delivery of the reindeer was the completion of the first stage of the Department of the Interior's long-considered plan for assisting the Eskimo inhabitants of the Canadian North. Some years ago it was realized that as civilization advanced into the North, the wild life upon which the natives depended for a living would be gradually depleted. A Royal Commission on Reindeer and Musk-ox was appointed in 1919 and since that body made its report additional investigations have been carried on with the object of implementing its findings. Experience has proven that there are periodical fluctuations in the number of fur-bearing animals and that caribou cannot be depended upon to follow the same migration routes each year. With the object of broadening the basis of subsistence of the natives, especially in view of the rapid advance of mining in the Northwest Territories, the Department of the Interior has for a considerable time been looking into the possibilities of increasing the numbers of the larger ruminants. It has been the desire of the Canadian Government to promote the introduction of an industry which the natives could develop rather than to establish a government industry and it was decided, before incurring the expense involved in introducing reindeer, to have a thorough investigation made. This investigation was to cover the country between the Alaska-Yukon International Boundary on the west, the Coppermine River on the east, Great Bear Lake on the south, and the Arctic Ocean on the north.

The study of this wide expanse of territory was to have the character of a general botanical reconnaissance with special reference to reindeer pasture, carrying capacity, and other general conditions of importance to a future reindeer industry. Since in Alaska the reindeer industry had become an outstanding success it was decided that, previous to the field work in Canada, the investigators should, with the permission of the United States Government, spend a season in Alaska, where an exhaustive study of the reindeer industry and its effect on the country and people would be made.

In April 1926 Mr. A. E. Porsild, an experienced botanist and Arctic traveler, was appointed to conduct such an investigation with the assistance of his brother, Mr. R. T. Porsild. By reason of the fact that these gentlemen had lived many years north of the Arctic Circle and could speak the Eskimo language they were eminently fitted to cope with the problems to be investigated. Their report contained the results of their 30 months' field work, of which 10 months were spent in Alaska. The investigation occupied from May 1926 until November 1928 and thus included two winters and three summers in the field, during which time, not including steamboat and railway traveling, an aggregate of 15,000 miles was traversed by dog team, canoe, motorboat, pack dogs, and snowshoes. Extensive biological collections were made whenever time and transportation permitted. The investigators returned with probably the largest single botanical collection ever brought back from Arctic America, comprising about 15,000 herbarium specimens of vascular plants and nearly 5,000 specimens of cryptograms, as well as a small collection of zoological specimens and about 1,000 photographs.

This investigation was followed in 1929 by the purchase of a herd of 3,000 reindeer in Alaska, delivery to be made at the reserve to the east of the delta of the Mackenzie River. Mr. A. E. Porsild went to Alaska during the summer of that year, and in mid-October a round-up of deer in the Buckland Valley took place at Napaktoolik, east of Elephant Point, Kotzebue Sound. However, owing to delays caused by heavy snowstorms the actual selection of the deer for the Canadian drive was not made until December. Altogether 2,890 does and 307 bucks were picked by the Dominion's representative. To these were added about 250 animals for food and draft purposes. The herd of 3,440 deer was immediately placed in charge of Mr. Andrew Bahr, a veteran Lapp herder, who was to be assisted on the drive by 3 other Lapp herders and 6 Eskimos. Fifty sleds, drawn by reindeer steers, were to carry the supplies. For 5 years and 2 months the herd was on its long trek. During the winter, blizzards, intense cold, and the attacks of wolves impeded the movement. In the summer, succeeding the fawning season, the herd grazed and rested while the young gained strength for the succeeding winter's drive. In the spring of 1933 the herd reached Canadian soil and plans were made to rest the animals during the summer and early autumn of that year in preparation for the 70-mile dash across the delta of the Mackenzie to the Kittigazuit station.

In January 1934 a crossing was attempted, but owing to severe weather conditions the herd stampeded during a blizzard and returned to their grazing ground near Shingle Point. The losses suffered by this reverse were more than made up in the fawning the

following summer, which took place at Head Point. The work of preparing for a second attempt was begun in good time in 1934. Profiting by the previous year's experience, rest camps were established along the proposed route and other precautions taken to assure the success of the crossing.

During the summer of 1934 the animals were moved about on the grazing area in the general vicinity of Shingle Point. In September a gradual movement eastward was begun and by early December the herd had reached Moose River on the western bank of the Mackenzie. After the river had frozen to a sufficient thickness to bear the weight of the herd, a heavy fall of snow was necessary to insure good footing for the deer. At this time the Arctic days were rapidly shortening, indicating the approach of the long Arctic night. As the period of the full moon meant good visibility, this was the part of the month chosen for the beginning of the drive.

An unseasonable rise in temperature spoiled carefully laid plans to have the herd delivered before Christmas, and the January full moon saw the river-ice swept clear of snow and no good footing available for the animals. However, the full moon of February 18 shed its light over more favorable conditions and the animals were started on their way. By directing the herd along the edge of the delta where the snow was plentiful no difficulty was encountered. The rest stations provided the herders with opportunities for needed food and rest and on February 21 the herd reached Tununuk, about 30 miles south and a little west of the summer range of the Government's reindeer station.

The deer made the crossing in good shape and with few losses as a result of accidents of travel. Those in charge of the drive for the vendors decided to rest the animals at this point and toward the end of February continued the movement by easy stages to the corrals. Three days were required for the 30-mile journey, after which the animals were put through the corrals, inspected, counted, and marked.

Three Lapp herders, who are members of the staff of the Canadian Government reindeer station, the construction of which had been begun in 1931, met the herd when it entered Canadian territory and continued with the drive, accustoming themselves to the animals. Upon the delivery of the reindeer they immediately began the work of establishing the animals in their new home. The reserve has an area of 6,600 square miles and consists of summer and winter grazing areas, with the main station buildings on the winter range. The summer grazing area in which the herd was placed when delivered has several structures on it for the handling of the herd and the accommodation of the staff. The main building is of frame construction and the three others are log cabins. One mile north of these buildings is the main corral, the largest unit of which is 450 feet in diameter.

The winter station is the larger of the two and in most respects the more important as the herd will spend the greater part of the year in that area. It is located inland along the east branch of the Mackenzie and its headquarters are about 50 miles by dog team from Aklavik. The buildings, which include the residence of the officer in charge, are erected on a fairly level plain about one-quarter of a

mile wide from which the Caribou Hills rise to an elevation of some 500 feet. The plain was at one time densely wooded but forest fires swept through it about half a century ago and the new growth now consists of canoe birch and spruce. On the high plateau to the east of the station there are no trees but it carries a splendid cover of reindeer moss. This area and that adjoining the Eskimo Lakes to the north constitute the principal winter range. The other buildings at the station, beside the frame residence of the officer in charge, include three log cabins for the herders; two warehouses; a log building as additional sleeping quarters; and a workshop. The station is also equipped with a powerboat for patrolling during open navigation. Both ranges are well watered and at present free from predatory animals, and altogether the location of the combined ranges is considered very satisfactory for the first stage of the work of introducing reindeer into the Canadian north.

The first fawning at the Government station took place early in the spring of 1935 shortly after the delivery of the animals. As a result, 811 fawns were added to the herd and the total number as shown by the August 1935 round-up was well over 3,000 animals.

The reindeer are now concentrated on their winter range, where they were moved during the latter half of September and October and that, ladies and gentlemen, is the story to date of Canada's reindeer experiment.

Discussion.

Dixon.—I spent time in the area where the drive originated. The difficulty we encountered with reindeer is the dilution of the strain by crossing with caribou. I think our Canadian friends will be forced to adopt some such methods as we have or they will run into difficulties.

Bonnycastle.—I do not know the plans of the Canadian Government, but the reindeer are being carefully herded so they cannot come in contact with the caribou.

Dixon.—It is difficult no matter how carefully they are herded as there are always strays.

STREAM AND LAKE IMPROVEMENT

TUESDAY MORNING, FEBRUARY 4, 1936

Chairman: DR. CARL L. HUBBS, University of Michigan, Ann Arbor, Mich.
Committee: DR. JOHN R. GREELEY, New York Conservation Department, Albany, N. Y.; DR. H. S. DAVIS, United States Bureau of Fisheries; DR. A. S. HAZZARD, Institute for Fisheries Research.

The meeting was opened by the chairman, Dr. Carl L. Hubbs, University of Michigan, Ann Arbor, Mich., with the following introductory remarks:

The stream and lake management session of the first North American Wildlife Conference is now declared in session. This is an historic moment in the history of fish management. Yesterday fish management as such was given the prominence of a half-day session in this conference. The field of fish management in the broad view is new. And the newest part of it is the work which we are here to take part in discussion today, stream and lake improvement, or the field of aquatic environmental control.

It is a long cry from the philosophy of conservation expressed in Rev. W. B. O. Peabody's "A Report on the Birds of Massachusetts", made to the legislature in the session of 1838–39 (Boston Journal of Natural History, vol. 3, 1841):

> * * * The order of nature supplies such game as a resource for the pioneers of civilization, while the process of clearing the soil goes on; till the earth is subdued, the deer, the birds, and the fish supply means of sustaining life. But when agriculture and the other arts of life begin to be pursued with profit and success, these resources cease to be needed; the habits of the hunter are inconsistent with regular industry; and as the game would only serve to tempt men away from their cares and duties, the forests and streams are deserted, and their wild tenants go where there are other adventures to need them.

In 1924 I chanced upon a pool in a Michigan trout creek where I found about 200 adult brook trout. After investigating this pool I journeyed upstream for a half mile over shoals and found nothing but a few fingerlings along the cover. The thought occurred to me then that it might be a fine policy for Michigan to hire men to haul in logs and snags, depositing them in the stream to make habitats for trout. No doubt others conceived of the same idea. Nothing was done, even in the way of a recommendation to our State department at that time. I did discuss this with the impetuous Dutchman Jan Metzelaar. I think it would not be indiscreet in retrospect to mention that when Jan Metzelaar wanted to start some State experiments in stream management, he could not get permission to do so from the State department. He had to write letters to be signed by sportsmen asking that this work be done. He went out and felled a few trees in some streams—this created some antagonism because it was not well done. That was hardly stream improvement of any consequence. It was 6 years ago, almost to the day, when

the Institute for Fisheries Research was established in Michigan. At the inception of our institute work one of the programs which we thought in need of development was that of stream improvement, so we put one of our young staff members on the job, Clarence M. Tarzwell. From the very start this field has met with opposition and some degree of antagonism, that is now vanishing. Now at forestry and fishery meetings stream improvement is the first or second matter brought up. The recognition of stream and lake improvement on this program is, to my mind, very gratifying. I think I have indicated something of my own thoughts in this matter. I do not wish to indicate or claim any priority for Michigan in developing this field. We took our part, and others have taken a part. I have simply told this little story and hope that some of the others will tell theirs, so that this early activity can be written. I will now call upon the first speaker, Clarence M. Tarzwell, who will give a discussion on "Lakes and Stream Improvement in Michigan."

Lake and Stream Improvement in Michigan

By Clarence M. Tarzwell, Institute of Fisheries Research, Department of Conservation and the University of Michigan

During the past 3 years lake and stream improvement has had a rapid, almost phenomenal, growth in popularity and use. As most of the work has been made possible through the use of emergency funds it has been essential to organize and carry out the work as rapidly as possible. Many streams and lakes have been worked without first being surveyed and much of the work has been carried out under an inexperienced and untrained personnel. The lack of adequate information concerning the methods of construction, the purpose of the various structures and the ecological changes brought about by them has been keenly felt and clearly shown in a great deal of the work. In view of these circumstances it is felt that the experience gained in Michigan during the past 6 years may be a help to others engaged in a similar undertaking.

Ten years ago, when discussing the decline of fishing in streams old fishermen spoke of the cleaning of the streams for log drives as the possible cause of that decline. Some advocated replacing the logs, trees, and wing jams as a means of bettering the fishing. A further development of this was the "resnagging" work carried on by Dr. Jan Metzelaar in the Pere Marquette and Little Manistee Rivers in 1928 and 1929. This "resnagging" consisted of the felling of large trees across the streams and the throwing of various materials into the streams so that they would float down and lodge against these barrier trees to form jams. It will be noted that such work takes into consideration only the formation of pools and cover and no thought was given to food or spawning conditions. As these jams continued to grow, in time they became so large that the tree could no longer hold them and they went out. As such "resnagging" work was incidental to other activities it was not extensive. It was, however, a beginning, and demonstrated that pools could be formed but that the mere throwing of material into a stream was not enough to bring about permanent results.

In 1930 with the creation of the Institute for Fisheries Research under the direction of Dr. Carl S. Hubbs the work was taken up in

a more intensive manner. A program of lake and stream surveys was initiated. Mr. R. W. Eschmeyer was placed in charge of the lake surveys and the lake improvements. The speaker was given the responsibility for developing, testing, and checking the results of various methods for improving trout streams.

In the summer of this first year the Michigan Department of Conservation made an appropriation for carrying on a project on the Little Manistee River in Lake County. Since this was the first project of its kind in the State and, in fact, to the best of the speaker's knowledge, the first in the country the work was of necessity an experimental project. Many types of structures were installed in order that their action might be observed and the best ones selected. Among the more successful types the following may be listed: wing, V and I deflectors made of logs or stone, tepee and raft covers, trees, and bank covers. A number of stumps were used but about half of them were washed away due to faulty installation.

Notes were taken on the condition of the stream before the structures were installed. Type of bottom, plant beds, mucky areas, depths, cover, and size and depth of pools were all noted as well as the type and construction of the device. Each device was tagged with a numbered metal tag so that future observations could be made. In all, 500 structures were described, tagged, and located during the first season.

In 1931 a recheck was made of the previous year's work and a knowledge was gained of what each structure could be expected to do. With this information as a working basis and with a better knowledge of the requirements of the trout and the deficiencies of the streams the work was continued in a more systematic manner. Devices were installed not only for the purpose of creating pools and cover but also to improve food conditions by producing riffles uncovering gravel areas, and creating mucky areas and plant beds. Various types of deflectors, such as V's, Y's, I's and A's, were used to bring about these conditions and also to create pools. Cover was furnished by various types of raft, bank, bend and center covers. Attention was given to the prevention of bank erosion by the use of large boom covers and bend covers. As in 1930 extensive records were made of each installation and its surroundings.

While it was possible to observe the formation of pools in a stream, further and more definite information was desired as to just how the so-called improvement devices influenced the fish population and the food. In order to secure this information, fish counts and food counts were made before the devices were installed. The location of these various counts were recorded so that recounts could be made some years after improvement when conditions again became more stable.

The fish counts were made by enclosing a portion of stream by barrier seines placed at the upper and lower ends of a selected section and then catching the fish in the section by the use of small seines. The barrier seines were held by means of stakes driven into the stream bed. Chicken wire was stretched across the stream in front of the stakes in order to give added support to the seines. This arrangement made it possible to hold the seines until all the fish in the section had been caught, measured and recorded.

The food counts consisted of quantitative bottom samples. These were made by collecting all the bottom organisms from a unit area. These organisms were preserved for future study. Counts were made at locations where devices were to be installed and a record of bottom type, depth, and surface current was secured. In this way it was hoped to obtain information concerning the manner and the extent to which food production was influenced or changed by the devices. Counts were made on the East Branch of Black River, Pigeon River, and Gamble Creek.

During the following year the work was continued and expended to streams in various localities. Rechecks were also made of all previous work and the ecological conditions noted. Underpass deflectors were found to be very efficient in the formation of pools. Wing deflectors proved to be most effective in the creation of muck areas and in the establishment of plant beds. Large boom covers and raft covers were found to be unstable as they were carried away by floods or they waterlogged and sank so that they became useless. Bank covers, square covers, tepee covers and wedge covers were found to be unsatisfactory in streams having a good deal of ice. In such streams it was necessary to submerge these covers below the ice level or ice forming around them would pull the stakes due to its lifting action. In constructing the submerged bank covers it was found to be well to imbed the holding legs into the bank at least as far as they projected into the stream. In general, deflectors were not affected by the ice, but it is well to keep them low and to bank them on the upstream side. V and Y deflectors were found to be especially useful for uncovering gravel by the removal of sand. This is one of the means of increasing food production. Wing deflectors, wing jams, and large bend covers were found to be effective in preventing bank erosion.

Except in certain locations stumps proved to be difficult to hold in place. In sandy bottom streams they often completely washed out the stakes holding them and in streams having a good deal of ice the stakes were pulled. A good method of holding stumps in place under such conditions is to fasten them to a stake by means of a 10- or 12-foot cable. The stake should be deeply imbedded and the cable fastened to it just above the stream bottom. In order to prevent ice from forming on the stake it should be cut off just above the stream bed. The advantage of the cable is that it allows the stump to raise and lower without exerting a direct upward thrust on the stake. Care should be used when placing stumps on a gravel bottom as the sand bar formed below the stump will often more than offset the value of the pool formed.

During the period from 1930 through 1932 the lake crew was engaged largely in survey work. They did, however, carry on some experiments in the installing of brush shelters, gravel spawning beds, and slabs as spawning places for blunt-nose minnows. Some plantings of aquatic vegetation were also made. In the fall of 1931 brush shelters, gravel beds, and slabs were placed in several lakes in Kalkaska County.

In 1931 the scope of lake and stream improvements was greatly increased due to the fact that E. C. W. and F. E. R. A. funds were available for such work. The Institute workers became associated

with the supervisory personnel and put to practice their findings, experience, and training for the purpose of carrying out further projects. Work was undertaken on several lakes and a number of streams. Brush shelters were installed in 18 lakes and some 27 miles of streams were improved. In addition to the installation of brush shelters aquatic vegetation was planted and gravel spawning beds were placed in several lakes. Slabs were also introduced to improve spawning conditions for certain minnows.

While construction work was emphasized, experimental work was not neglected. Records were kept of the devices installed in lakes, and notes were taken on the ecological conditions before the work was carried out. An experiment was carried out in Tomahawk Lake to determine what devices were most suitable for encouraging the spawning of blunt-nose minnows. This lake was chosen because minnows were abundant there. Various types and sizes of devices were installed. It was found that the minnows preferred a slab or other flat object which was at least 6 inches wide and placed directly on a sandy bottom in 6 to 18 inches of water. Several will spawn on one slab and their eggs are often in one mass.

To date the planting of aquatic vegetation in lakes has not been very successful. When plants have been placed in barren lakes they died or became gradually smaller and weaker. These results have led to a feeling that most plants have sufficient means of dispersal and they occur naturally in lakes where conditions are suitable to their growth. Thus indiscriminate planting is not thought to be of much value. Proper plantings in artificial lakes are felt to be of value.

Experiments were conducted in Howe Lake, Crawford County, to determine the results obtained from the introduction of gravel to form spawning beds for bass. One hundred and three gravel beds were placed over a sandy bottom in 1½ to 3½ feet of water. These nests were observed during the entire spawning period. All nests which were noted were made on the gravel which had been added to the lake. It was observed that even though gravel piles were placed close together nests were not made closer than 8 to 10 feet from each other. The most favorable depth was 2 to 3 feet. There is also an indication that at least a bushel of gravel is required, since when a smaller amount is used the bass dig a deep bowl-shaped nest, probably in search of more gravel. If storms occur at spawning time such nests on sandy bottoms become partially filled with sand and are thus destroyed. There is reason to believe that these artificial nests improved spawning conditions. Previous to these experiments the lake was seined each year to secure young bass. Until the time of improvement 2,500 was the greatest number secured, while after the addition of the nests 15,000 were secured.

Investigations to determine the efficiency of the brush shelters have also been conducted. Seines have been placed around many of the shelters, and then the brush has been removed so that it was possible to catch the fish which were in or around the shelter. It is apparent that some fish are attracted to the shelters more than others. The normally free-swimming fish were not attracted to any extent, while those usually favoring weed beds were found around the shelters. Suckers, which were also abundant around the shelters, were probably attracted by the abundance of algae and other types

of food. Crayfish and aquatic insects were especially abundant in the shelters. A large shelter with loose rough edges attracted large fish, while small, tight, smooth shelters never attracted large fish, but were inhabited by small fish. The large fish were adult bass and suckers, while the small fish were young bass, bluegills, rock bass, suckers, and minnows.

In addition to the 27 miles of stream improvement accomplished in 1933, bank-erosion control was carried out along the Pere Marquette River. Several methods were used to hold the upper portions of the banks and protect them from erosion by wind and rain. Terraces held by stakes and poles were used on some banks, while brush or poplar pole mats were used on others. On some banks, a more expensive method was used. The banks were given a uniform slope and then large logs were stood up so that they extended from the bottom to the top of the bank. Poles were then fastened to these logs at right angles and about a foot apart. Each of these formed a small terrace. Straw or rich soil was placed on these terraces and they were sown with various grasses and trees planted at frequent intervals. Of the methods used to date, the latter has proved to be most successful.

Since 1934, the institute has not been concerned with the actual construction work, as it was felt that field had been developed to a stage where it was no longer within its province. The institute has confined its efforts to an evaluation of the work, and has acted in an advisory capacity to give aid in biological matters and in the interpretation of results.

During the past 2 years the organization has been improved, and the extent of the work has been greatly increased. Mr. Roy Johnston, who is now in direct charge of the work, has kindly furnished data on the amount of work accomplished during this period. During the past two winters, brush shelters and other improvements such as gravel spawning beds and slabs for minnows have been installed in 180 lakes. In 1934, 118 miles of stream were improved, and in 1935, 132 miles of stream were improved. In addition to this work, in 1935 some 700 miles of stream were conditioned for future improvements. This conditioning work was confined to the slower streams of the Upper Peninsula, and consisted of the cleaning out of debris left from logging operations and the improvement of springs and spring runs by cleaning and the formation of definite channels. This conditioning work will in itself greatly improve stream conditions. In addition the erosion of sand banks along 22 miles of stream was controlled. The improvement crews were also active in the improvement of environmental conditions by the removal of beaver dams, 3,786 being removed from trout streams. There were 2,306 miles of stream opened for trout migration.

In 1934 and 1935 rechecks were made on fish counts and food counts. In those sections where it was possible to obtain goods counts it was found that either the total number or the number of legal fish had been increased. The rechecks on the food counts showed an increase in food production around the deflectors. An increase of as much as 40 times has been secured. The fast riffles and the mucky areas and plant beds have been found to be productive.

Environmental improvement is a problem in applied ecology. Every lake and stream presents a different problem and its improve-

ment is not so simple as some believe. If we are to improve conditions effectively we must have a knowledge of the habits and know the requirements of the various species which we wish to encourage. Further we must know what necessary factors are lacking or out of balance. We must know how to restore them or put them in their proper relation to other factors necessary for good production. It is therefore apparent that an adequate survey of the waters must be made and experimentation, investigation, and elevation carried out to determine how the needs must be met. Fall, winter, summer, and spring conditions must be known before we can efficiently improve our waters. If we are effectively to improve the fishing an effort should be made to remedy defects which manifest themselves at each season of the year. All too often the tendency is to think of conditions only during one season. An example of this is the results obtained in a Michigan stream. In most cases the ice which forms below the deflectors gives protection and cover for the fish. On the north branch of the Au Sable, which is a wide shallow stream, this is not true, as during cold periods the water behind the wings freezes solid and the fish are trapped and killed.

Flow, temperature, and the amount of ice during the winter are ecological factors which are often overlooked. The action of ice is much different than many suppose. Trout streams, which warm up most of the summer, are generally considered to be most affected by ice, freeze over early in the season, and are protected from extreme cold so that destructive anchor ice does not form. Streams which are immediately spring fed are not affected, due to their higher winter temperature. It is the intermediate streams which suffer most from anchor and slush ice, as they do not have a blanket of ice to protect them. Anchor ice, which forms on the bottom during cold nights, covers the rocks and freezes the insects. At one time during the extreme winter of 1933–34 the bottom of a stream was frozen so that the gravel could not be moved. Such conditions are certainly not beneficial to the food of fish and suggest a reason why brook trout spawn at or near springs. Such occurrences as these clearly demonstrate the need of further investigation. While some information has been gained, we have really only begun on the problems of environmental improvement and much further study is needed before it can be placed on a sound practical basis.

Lake and Stream Improvement in New York

(By John R. Greeley, Ichthyologist, New York State Conservation Department)

The general aim of the management practices which are familiar to most of us under the names of "lake-and-stream improvement" is to increase the capacities of the waters to produce. The theoretical soundness of improving environments which are more or less unfavorable is generally accepted. There are likely to be long and laborious steps between a theory and its practical accomplishment. This is true in the field of environmental control.

For this reason it appears desirable for various workers in this field to report progress and to compare notes on the development of this branch of fisheries management. Comparatively rapid though this development has been, all work along this line yet accomplished repre-

sents but a small fraction of what might be done, although only time can tell whether or not it will be done. Certainly there are limitations in this field, both in lack of knowledge and in the extent to which certain limiting factors are controllable.

In New York State, through the labor facilities afforded by the Civilian Conservation Corps, a large number of stream and lake improvements for the betterment of fishing have been made. Yet such improvements involve only a minor fraction of the waters subject to public control, and even this is but a fraction of the total area of waters, since there is an extensive mileage under private control.

Practically all of the stream and lake improvements for fish purposes done by the Civilian Conservation Corps are in trout waters. While other fish resources might have been given attention, many circumstances favor giving primary attention to trout. The small size of the streams in relation to their value for public recreation, the extensive State ownership of stream headwaters where trout are the principal game fish, and the greater available information on methods of improvement are all considerations. The large waters devoted to warm-water game fish are more difficult to improve as the smaller trout waters.

Between April 1, 1934, and October 1, 1935, there were 85 miles of streams improved. This work was participated in by over 20 camps. None of these devoted more than a small fraction of their total expended labor to this type of project. In general, wherever desirable fish-improvement possibilities were located within reach of a camp, more or less labor was made available from that camp for these projects. The lands of the Adirondack and Catskill forest preserves afford the greatest opportunities. Reforestation areas, particularly in the south central part of the State, also have a large mileage of State-owned streams. Game refuges, State parks, and other lands under State ownership afford a smaller number of fish projects.

Lake improvements are difficult to classify, as some of the dams installed by Civilian Conservation Corps labor are primarily for purposes of waterfowl improvements or general public recreation, while others are planned primarily as fish projects. Wherever there is water there are likely to be fish, and some of the projects put in primarily for other purposes will add to the fish resources of the State.

Throughout the Adirondacks there are numerous old dams, installed for logging purposes. Some of these have gone out, leaving flats covered with stumps and bog vegetation. By building up these old dams or a new dam at the same site, a number of lakes have been made. There are nine completed projects of this type.

One dam, on the west branch of the Sacandaga River, was built for the purpose of a barrier to protect this excellent trout stream from the heavy run of northern pike which formerly ascended this river from the Sacandaga Reservoir. The apron is so designed as to discourage jumping of these fish.

As evident from the above, the lake improvements in New York State have been confined to building of lakes or restoring of former lake levels. The use of brush shelters and other devices for the increase of shelter facilities has not been undertaken. There are some lakes which would be improved by additional shelter but on the whole there are comparatively few of the sandy type which con-

spicuously lack shelter. Rocky shores, stumps, or other shelter facilities are normally present.

The most frequent type of stream improvement is construction of pools in streams which are too shallow, with long areas of flat water where even the most optimistic angler would not expect a good-sized trout to be living. Temperature protection, through narrowing exposed areas by use of deflectors or by lowering the channel by digging is another important aspect of the work. Cleaning and ditching of some of the marshy spring runs is another practice which aids temperature conditions. The planting of willow cuttings, done at three camps last spring on an experimental scale, gave excellent results.

Especially on the wide, warm, flat streams which are so prevalent in the southern and central part of the State, planting of willows is a method of environmental improvement which should be of increasing importance in the future.

The flood of last summer, which struck the smaller streams of central New York with unprecedented severity, served to emphasize the hazardous condition of many streams. When trees are present the stream banks are fortified by the roots and the water is forced toward midchannel. This results in scouring action of midchannel and streams run deep and relatively narrow, keeping their channels clear of debris which would otherwise block them.

Clearing of streamside brush is a common practice, since each farmer usually wants to increase the area of productive pasturage or crop lands. Removal of the alders, willows, or other trees allows bank erosion and as the banks give way the streams become wider. Since the transporting power of the water on this wide frontage becomes lessened, the channel tends to block with stones and the result is a wide, flat stream. Temperature and pool conditions are usually unfavorable for trout. This is not the whole story, however, since the hazard of a stream of this wide, shallow type is not confined to damage to fish. Flood waters, no longer forced into a midchannel path of maximum erosion, erode at the edges, skinning off good agricultural land.

It would pay many landowners, in the long run, to leave a zone of brush and trees or to plant them, where they do not grow naturally. This seems to be the most economical way to get the streams back into less hazardous condition.

Erosion is being controlled as a part of the trout-stream improvement work. This is attacked by turning streams away from points where destructive erosion is developing or is likely, by removing debris where this is located so as to turn the current toward the banks and by building log retaining walls to strengthen banks. Some large slides, which annually contribute tons of sand or silt to streams, have been checked.

Another side of this work consists in protection of trout streams against undesirable fish which run up from below. A barrier dam, with log apron so arranged that perch, pickerel, or other fish cannot jump, has proven a very successful construction in preventing upstream migration of undesirable fish.

Split streams, which run in several channels and do not have sufficient water in any one channel to form good pools, and con-

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Beaver lodge in stream. (Forest Service photo.)

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Bobcats in the pose in Absaroka National Forest, Mont. (Forest Service photo.)

trolled by blocking side channels in order to get all the water together. Improvements in the character of the water have sometimes been made by decreasing the amount of water standing on decomposing muck and by keeping the stream moving along more rapidly.

Small dams, faced with boards, readjustment of boulders to form rocky pools, deflectors which turn the water, and many other constructions are useful. It is the aim to do this work economically, using logs and boulders available at the stream, and to put the stream in as good condition as possible with the means at hand. Elaborate work is neither justified nor desirable, and no one likes to see artificial-looking work along trout streams. Permanence is an essential, of course. There is reason to believe that properly constructed improvements will last many years. Inspection of two improved streams hit by the flood of last July indicated total damage not exceeding 10 percent, which is remarkable considering the extreme violence of this flood. Most of the modifications are along lines for which Nature sets the pattern. Usually, in looking over a stream, a good working basis can be derived from study of the best of the natural places.

In checking the results of stream-improvement work, there is an important handicap in that it has not proven practicable to study each of the many streams intensively for a long period before and after the work. In checking over a number of samples of the work done last year, I have been well satisfied that more good-sized trout can be carried than before improvement. I do not mean that any and all improved streams are fishermen's paradises. A small stream, without good pools, produces only a few fish of legal size. Improve it and it produces more. It still remains a small stream, easily fished out of large fish. Fishing pressure acts to keep large fish scarce on improved as well as unimproved streams.

The degree of success would need to be measured by catch records before and after improvement, not by measuring what is left in the stream. Unfortunately, catch records on each of the streams are at present impossible to obtain.

It may seem surprising that catches of trout are made a year after improvements, in areas formerly unsuited to production of legal-sized fish. Most streams, if any good at all for trout, have quite a number of young fish toward their headwaters. Such young fish soon take possession of improved areas and after growing 1 year are likely to be legal-sized fish unless hindered by excessively cold water or poor food supply, such as is induced by excessive crowding. The management of unfavorably balanced populations in lakes and streams is a subject requiring much investigation of principles and applied methods. In fact, such work as has been done is to be regarded as more or less in the nature of pioneering.

The growth-rate investigations of the Biological Survey have disclosed a great range of rapidity of growth of trout, bass, perch, and some other species. We have lakes where perch run large and lakes where they are small and also very numerous. Our survey reports have pointed out that lakes frequently develop large populations of such fish as perch, sunfish, and rock bass, crowded, stunted, and of slight attraction to the angler but keeping the lake

in a state of poor production. You might say, well then, plant heavily with young bass or other species to forage down these others. But where we have a crowded population of 3- to 5-inch rock bass, some of which are over 5 years old, it is hardly logical to expect that stocked fish can increase against this competition. The only parallel that I can think of would be for a farmer to sow his corn down in his scrub pasture or woodlot instead of in carefully prepared ground. Even on plowed land he gets no crop unless he cultivates to remove weeds.

When we do progress sufficiently, and it will take time and money, of course, in the field of removing excess fish the technique should be patterned after the cultivation of field crops in that it will be a problem of controlling what is locally undesirable rather than giving any species a black eye and trying to exterminate it in all waters.

Some of the principal unfavorable environmental conditions that the surveys have brought to light as more or less prevalent in the waters of the State can be listed as follows:

(1) High temperatures (affecting trout especially): To some extent subject to control through ditching of spring, narrowing of streams, and planting of shade.

(2) Poor pool conditions, uniformly shallow areas where fish find little shelter, especially in low water: Most of the stream improvement done has been devoted toward remedy of such conditions.

(3) Unbalanced population conditions: Particularly prevalent is overcrowding of relatively less valuable forms of fish life, and overcrowding and stunting of game fish. Some species are undesirable in the particular waters they inhabit and interfere with species which would otherwise do well in these waters. Competition is often too severe to allow each individual the food supply that it should have in order to produce a fish of valuable size. Barrier dams have been used to keep undesirable fish, particularly perch and pickerel (northern pike) from migrating up into trout waters.

(4) Depletion of the more sought-after species: This tends to upset the balance already mentioned, by allowing unfavorable species to increase. This is difficult to control. The work done has increased water areas and probably added slightly to chances for escape of fish.

(5) Parasites: Particularly important here are the grubs which affect the value of fish to the angler and internal parasites which affect the health of the fish. Possibly other diseases than those caused by parasites should be listed, although there is as yet little information available on the seriousness of most diseases in wild waters. Decrease of ponded areas may have a limiting effect on pond snails, the intermediate hosts of grubs. Work done, so far, has probably had slight effect on parasite conditions.

(6) Unfavorable spawning places: Dams, both those built by humans and beavers, should be listed here with respect to their action under some circumstances in blocking fish from reaching their spawning grounds. This factor is supposed to have been responsible for the extermination of the natural run of the Atlantic salmon, for example. Wherever it has been practicable to remove barriers, clean out spring runs, and increase gravel beds, spawning areas have been favored. It is doubtful if lack of spawning areas constitutes a prin-

cipal limiting factor in most of the streams concerned, although this subject needs study.

(7) Unfavorable physical and chemical conditions in the water: These are various. Most conspicuous is the low oxygen supply of many waters due to decomposition. Several projects in lake and stream work have involved removal of decomposable debris.

(8) Low natural fertility: Many waters, especially those which are very pure and cold, do not produce many fish merely because there are insufficient amounts of fertilizing substances to supply abundant amounts of the necessary plant life which is basic to the development of a food supply for fish. Practicable means for modification of this limiting factor are not available.

The improvement of environmental conditions for the purpose of improving fish yields constitutes a problem in applied ecology. This type of management requires research, in that the limiting factors of each environment need to be determined. The accomplishment of the changes which are indicated as desirable requires practical application of improvement methods by skilled field crews.

In New York State field surveys of approximately five-sixths of the streams and lakes of the State have been completed in the last 10 years by the Bureau of Biological Survey of the Conservation Department. The information resulting from this extensive field work goes far toward providing the necessary scientific basis for planning improvements. Requirements along lines of practical application have been met by field workers of the Civilian Conservation Corps organization and of the Conservation Department.

(No discussion.)

Stream Improvement in Pennsylvania and Its Results

(By O. M. Deibler, Commissioner of Fisheries, Harrisburg, Pa.)

The subject of stream improvement or stream farming has become one of paramount importance. Especially is this true in the highly industrialized States of the East, where the fishermen have been observing from year to year the diminishing of their fishing waters at an alarming rate. At the same time it was noted that each year a heavier toll of fish life was being taken from our remaining available public waters. This loss of public streams that formerly afforded fishing has been brought about by three factors. First, and by far the most important, is the matter of pollution. In Pennsylvania, where we have two large coal basins—namely, the anthracite field, which covers a large portion of northeastern Pennsylvania, and the bituminous region, which extends from the central part of the State west and south to our borders—while industrial and municipal pollutions are serious, yet the mine drainage is even more threatening and affects approximately three-quarters of the mileage of our major streams.

Second in importance is the leasing or purchasing of many of our most worth-while streams by private individuals and clubs, until today 1 mile out of every 7 on our trout waters in Pennsylvania is closed to public fishing.

The third factor is the posting against public fishing, by individual owners. This has been brought about largely by the fishermen themselves, not the sportsmen. Shrinkage of fishable waters to less

than one-quarter of what they formerly were, in addition to the ever-increasing number of fishermen, who today have more time and leisure to fish than at any other time in our history, has created an unusually heavy demand on the remaining waters that still offer any fishing.

Since 1930 in Pennsylvania we have been confronted with another situation that was so grave that the matter of stream improvement was most forcibly brought to our minds. I refer to the serious drought conditions through which we have passed during the past 5 years. During this period, previously never-failing springs, and streams that had formerly carried a substantial flow and offered excellent protection to fish life, became dry or virtually dry, only little trickles and a few pools remaining. As an additional menace, our wardens and fishermen observed another threat to our various fresh-water species of fishes, occasioned by great migrations of all types of fish predators. Never in the memory of our oldest anglers were so many watersnakes seen on our streams, nor had there been noted before such great numbers of fish-eating birds which had migrated to the State during the drought period. The white egret, for instance, which had rarely if ever been seen on our streams, was now observed in flocks numbering as many as two dozen birds. These egrets, with the blue heron, many types of bittern and other shore-wading birds, found it easy, during low-water periods, to feast on fish life which had little if any protection. Nature seems to have an amazing and unique system of communication or instinct whereby information of this kind is broadcast among predatory birds and animals.

The board of fish commissioners in 1931 started an extensive and comprehensive survey of the waters of our Commonwealth. This was forced upon us by the necessity of finding suitable waters in which to plant the fish which we then had in our rearing ponds, as many streams that were formerly stocked were now in no condition to be stocked. After the first reports of our field men came in, we found, very much to our surprise, that we were receiving a great deal of information which had not been anticipated when the survey was first ordered. This survey was carried on for 4 years, until we had completed by watersheds the whole water system of the State. It furnished us with a comprehensive picture, for the first time, of the exact mileage of polluted waters, waters which had been closed to the public for fishing, and acreage of our ponds and lakes. The survey likewise furnished us with first-hand authentic information as to the various species of fishes best adapted to waters throughout the State. However, some of the results of this survey were most alarming and brought to the sportsmen, for the first time, the necessity for carefully guarding and protecting the few remaining miles of clean waters we still had. Yet the facts reveal that for each mile of stream still suitable for support of fish life, we had approximately 4½ miles of water so highly polluted that no type of aquatic life could exist in it. These facts also reveal to us the astounding fact that should our anglers all go astream on the same day, available fishing waters would be so congested that each fisherman would have available only 90 feet of stream as his territory.

With these figures before us we were faced with a problem somewhat similar to that of the farmer during the post-war period when

the demand for foodstuffs was greater than the supply, and the Federal Government asked farmers to farm more intensively, so that they could make two blades of grass grow where one grew before. With the picture outline before us and the ever-increasing demand on our streams and decreased waters, we were compelled to face the problem of more intensive farming of our streams, or, in other words, the necessity of increasing their productivity by making it possible for several fish to grow where only one grew before.

Until the spring of 1933 very little practical stream-improvement work had been carried on anywhere on streams of similar nature to that of our swift-flowing streams in the mountains of Pennsylvania. However, we learned of excellent results that were obtained on the Neversink River, in New York, by Edward R. Hewitt, who had accomplished the very thing that we were anxious to put across. After visiting this project and gaining what information we could, this gave us a starting point. Our board decided that, in their opinion, the most practical way in which to put over this program and to have the sportsmen, whose job we thought it was to carry on this work, become interested, would be to establish a model project that would be centrally located in the State. We were, indeed, most fortunate that we were able to purchase some mileage on Spring Creek, near Bellefonte, the exact geographic center of the State. This is one of the most widely known trout streams in the East and possibly the most popular in our State. The nature of the stream also offered all the possibilities one could hope for.

After the property was secured we started to work with the knowledge and information we had been able to gather and with what little stream sense we possessed ourselves. We began improving this stretch of water with every device we knew, until we felt we had a fairly concrete example of what could be done. This particular stretch of water, before improvement work was started, had approximately three pools on a stretch of 1¼ miles that afforded habitat and protection for fish. The greater part of the remaining mileage comprised a rather long sluggish section with little visible current apparent, while other sections were wide, with extremely shallow riffles. After the project reached completion, the thought occurred as to whether the sportsmen, in whose interests this work was accomplished, would be sufficiently interested to come and study the project with a viewpoint of taking this knowledge back to their respective clubs and districts. Grave doubts arose in our minds as to whether sufficient sportsmen could be induced to come and study something that would not offer anything more than cold facts.

Realizing that fishermen, perhaps, were no different from men in other walks of life, who usually need some additional inducement, trivial though sometimes it may be, to come out for the more important things, we thought perhaps our sportsmen might feel the same way about it. In order to offer an added appeal, it was decided to give our fishermen some trout fishing de luxe, which would bring them if anything would. In this we were not mistaken, as on the opening day at the project, despite inclement weather, there were approximately 3,000 visitors present, with 472 of them registering and actually enjoying the sport provided. This phase of the project, while not considered with the stream-improvement work at the beginning, has been demonstrated to be quite as worth-while from a

conservation point of view as the stream farming itself. This factor enables us to demonstrate, in a practical manner, that the carrying capacity of any stream, well improved, will have been increased manyfold. This we proved by stocking 9,000 trout, ranging in length from 10 to 17 inches in this mile and a quarter of improved stream and to find that they stayed put in their new environment.

We were also able to demonstrate true sportsmanship to that class of fishermen, of whom every State has too many, and whom we term "killers" rather than sportsmen. This type of angler can only measure the success of his fishing trip or sport by the number of dead fish he takes home to exhibit to friends. By placing restrictions on the fishing and limiting the daily kill to 2 trout, 10 inches or over in length, for each fisherman, we at the same time permitted him to catch and release 15 trout, the legal creel limit in our State. All fishing was limited to artificial lures with barbs on the hooks pressed down. This feature of the experimental project has been most popular, as a very small percentage of the thousands who have visited Spring Creek and enjoyed the sport during the past 2 years have complained about the number of fish they were permitted to kill. Many expert anglers refused to kill any. One particular chap told me on the closing day of the season last year that he had caught 57 large trout but had not killed any, as he felt that he could not afford to kill fish so valuable to the sportsman. He felt the same was true of other sportsmen—that they were worth many times more alive in the stream where they could furnish sport—than they were dead in his creel. With the hearty support the sportsmen have given this project, we felt it advisable to adopt a new slogan last year for the board which seemed quite appropriate where fishing conditions exist as they do in Pennsylvania. This slogan is "If you would catch more fish—kill less!"

Another angle presented itself on this project. Previously we had not catered to another class of the fishing public, who without doubt will play a very important part in our future conservation work. I refer to milady, the would-be angler. We had an excellent opportunity to set aside a quarter mile of a beautiful smaller trout stream on the property, exclusively for lady anglers. Here they could fish and swish to their hearts' content, without being annoyed by critical hubby. This has proved quite as popular as the main project for the men. During the first year we had 266 lady anglers, many of whom had never fished before and for the first time purchased a license right on the property. This number was increased in 1935 to 647 ladies, while the registered men fishermen in 1934 numbered 4,808, and in 1935 increased to 6,163. It is to be observed that the lady anglers increased approximately 300 percent, while the men increased a mere 50 percent. A competent instructor and fly caster was available for the ladies who were taking up the art for the first time. When we succeed in selling fishing to our wives and sweethearts in a thorough manner, it will not be necessary in the future for us men folks to manufacture so many excuses and unbelievable stories as has been the rule in the past when we were contemplating a fishing trip.

The results of the establishment of this outdoor laboratory, which I have tried to describe, is self-evident from the fact that during the

first year stream improvement work was carried on in approximately 17 counties by various sportsmen's organizations, who furnished the labor, financed the purchase of what materials were needed, and did some worthwhile work.

The stream improvement idea was so thoroughly sold by last spring that in almost every county of the State the sportsmen themselves were carrying on the work, or were successful in setting up Federal-aid projects. During 1935 over one-half million dollars of Works Progress Administration funds were allocated for projects in 50 counties, which should add a total stream mileage of almost a thousand miles of improved streams to those already improved. A number of large worth-while dams and lakes have also been built, others being constructed at the present time. Stream-improvement projects now in progress and others that have been approved, will, I feel confident, more than double the carrying capacity of our streams. With normal rainfall, I feel the outlook for our fishermen is much more promising than it has been at any time for the past five years. This has been brought about largely through the practical demonstration of the value of intensive stream farming at our Bellefonte outdoor fishermen's laboratory.

Development of Fisheries and Wildlife in and Around Impounded Waters

(By Edward C. M. Richards, Chief Forester, Tennessee Valley Authority)

In dealing with this subject, I will approach it from the particular viewpoint of the Forestry Division of the Tennessee Valley Authority and will confine my remarks to some of the specific problems of fisheries and wildlife development now faced which have been caused by the construction of the dams in the Tennessee River drainage basin.

It is gratifying to be able to speak of the close cooperation between the United States Bureau of Fisheries, the Biological Survey, and the Authority in working out our problems. The splendid technical assistance and advice which has been contributed to the joint enterprise by the experts of both of these Federal agencies has gone far toward getting the fisheries and wildfowl phases of the Authority's work well started and there is much to feel encouraged about as far as the plans for the future in this joint cooperative enterprise is concerned.

The Authority is constructing, as you know, certain storage and run-of-river dams. The purposes of this construction is the improvement of navigation, the control of destructive flood waters, the generation of power as a byproduct of such improvement, and the general use of the secondary resources touched upon by the project as a whole.

The Tennessee River and its tributaries drain an area of some 40,600 square miles. The Tennessee itself starts a few miles above Knoxville with the junction of the French, Broad, and Holston Rivers. Six hundred and fifty-two river miles away in a tortuous course, the river empties into the Ohio River at Paducah, Ky.

Storage plants are being built in the highlands. One such—Norris Dam—is virtually completed. It is located on the Clinch River,

some 25 miles northwest of Knoxville. Another is soon slated to get under way on the Hiwassee River in North Carolina.

Four run-of-river dams now are under construction in the Tennessee River. Briefly they are: The Chickamauga Dam, 7 miles above Chattanooga; the Guntersville Dam, near Guntersville, Ala.; the Wheeler Dam, 15½ miles above Muscle Shoals; and the Pickwick Landing Dam, in southwestern Tennessee. And as you know, another such run-of-river dam—Wilson Dam—is in operation at Muscle Shoals, having been turned over to the Authority when the latter was created by act of Congress in 1933.

These two types of dams are so different in their uses as to make a considerable difference in their relationship to the development of fisheries and wildlife in and around them, as I will soon show.

The four run-of-river dams—Wheeler, Pickwick, Guntersville, and Chickamauga—will create upon the Tennessee River an unbroken series of lakes extending 325 miles, or more than half of the total length of the river, when the present existing Wilson Lake and Hale's Bar Lake are included. In all of these run-of-river lakes the fluctuation of the water under all normal conditions is going to be very slight, approximately 5 feet annually. In the case of the large storage lakes, like Norris and Hiwassee, the fluctuation of the water is going to be very great, 65 feet in the case of Norris and 98 feet in the case of Hiwassee. There is also a great difference in the total depth in the two types of lakes. For the run-of-river type, the water at the dam will be between 50 and 70 feet deep at normal water level, whereas the two storage lakes will have depths of 205 feet at Norris and 265 feet at Hiwassee. All of these engineering statistics have a very great bearing upon the biological factors of vegetation and animate life in and around the waters and hence a great importance upon the wildlife and fisheries possibilities.

One interesting and important relationship exists between the range of shore lines of the lakes and the fisheries and wildlife development. Some of the T. V. A. lakes are of comparatively simple contour and not very irregular in shore line. For instance, the Hiwassee Lake shore line is to be only about 150 miles around. The Wheeler Reservoir, on the other hand, will have 1,063 miles of shore line. The Norris Reservoir will have 705 miles of irregular line, and the other lakes between that and 550 miles, which is the shore line of the Pickwick Lake.

The control over floods and the improvement and protection of navigation, with the accompanying possible development of water power, are increasingly important phases of American civilization, and they will continue to be so in the future. Foresters are primarily concerned with these developments because of their work in the protection of watersheds through establishment and maintenance of vegetative cover. They also are interested in the development of all those phases of land and water use which go along with the whole problem of the construction of dams and the development of watershed protection. The forester is the manager of nonagricultural lands. He arranges for the most practical use of all those land and water resources, such as farm game, forest game, migratory wildfowl, fur-bearers, and fisheries, all of which are often found to be factors in such a project.

The engineers build the dams, the foresters manage the lands needed for protection of the lakes established, and try to make the most out of their wildlife possibilities.

From the fisheries' viewpoint, the possibilities of the many lakes which are being created by the construction of the T. V. A. dams, as demonstrations of a coordination of fisheries with engineering, forestry, soil-erosion control, and wildlife, are very great. Each lake has distinctive and individual characteristics, offering a splendid opportunity to fit a suitable fisheries program into its hydraulic engineering program.

Among the solutions of the fisheries problems which will be sought are the relationship of natural reproduction of black bass, bream, and some of the rough fish in lakes with a large fluctuation of water; the technique and practical creation and administration of lateral dams maintaining stationary level side pools around lakes, which, in themselves, have a heavy fluctuation of water level; the protection and maintenance of adequate food supplies in lakes with large fluctuations of water levels; the relationship of the silt load of the water to the technique for the prevention of soil erosion on the watershed; the relationship of the gaseous content of the water in the lower strata of deep lakes as affected by the retention of stumps and logs at the bottom of the lake, and the effect of water pollution from bituminous-coal mines on fish living in deep-water lakes.

The answers to these and other problems will be of real value for the inland-fisheries development elsewhere.

Then, too, we must consider the use of waters of the lakes for migratory wildfowl and certain of the fur-bearers; and the land around the lakes for such upland forest and farm game, as deer, wild turkey, quail, ruffed grouse, ring-necked pheasant, coon, possum, and insectiverous and other birds.

The Tennessee River itself is not on a main flyway of migratory wild fowl. But there is some possibility that the creation of this long border of still water will tend to attract larger numbers of wild fowl into the Tennessee Valley than heretofore. This is especially true if some effort is made to render these lakes attractive to migratory visitors.

Real possibilities exist that parts of these lakes, especially shallow areas, could become resting places or even resting areas for wild fowl. Naturally the lakes vary insofar as being suitable for this purpose. Fitting wild-fowl requirements into an engineering program such as that of the Authority is indeed a promising field for study and investigation.

The fluctuation of the water levels naturally will have an affect upon the growth of various kinds of vegetation. This, in turn, will affect the food possibilities for migratory wildfowl and for such of the fur bearers as muskrats, beaver, and mink.

While these problems may present at this time severe obstacles in the way of an adequate solution, nevertheless the use of T. V. A. lakes for making studies and experimental demonstrations to fit wildfowl management into engineering management is challenging.

The approach of the Forestry Division toward the use of the lands and waters committed to its charge is that of the greatest good to the greatest number in the long run. Hence the development of

wildlife and fisheries in the Tennessee Valley is of interest to the T. V. A. not only from the viewpoint of sportsmen but even more so from that of the general welfare of the people of the Tennessee Valley. The possibilities of increasing the available food supply, the amount of part-time labor and incomes through the development of wildlife and fisheries for people living near the T. V. A. lakes is of great interest to the T. V. A. Coupled with the adequate development of the forests of the Tennessee Valley both for timber products, wildlife development, and forest recreational use, the Authority looks to the activities of the forester and the wildlife manager to do much for the economic welfare of the people through the use of lands and waters which have heretofore largely lain unproductive. Increasing support for this program is coming from hunters and fishermen and from others in the valley. It is most encouraging to know that this is the case.

The relationship of the development of fisheries, forests, and wildlife to the health of the people of the valley must not be ignored. We must consider the development of a wildlife program in its relationship to malaria, wherever present. Here the Division finds it is working in an important and interesting field, attacking the mutual problems of forests, fisheries, and game as they affect the breeding of anopheles quadrimauclatus. In its mosquito-elimination program the T. V. A. is leaving no stone unturned in analyzing, experimenting, and demonstrating all the forms of malarial mosquito control that give promise of success. In this important work the T. V. A. Health and Sanitation and Forestry Divisions, the United States Bureau of Fisheries, and the United States Biological Survey are working together to find and make the necessary adjustments for a maximum development of fish, forest, and game coupled with the elimination of malarial mosquitoes.

If the friendly open-mindedness and spirit of cooperation between the fisheries experts, the game men, the foresters, and the malarial technician is any indication of the success which will be attained, nothing but a most optimistic outlook can fairly be taken now.

There remains the problem of the development of wildlife on lands owned by the United States and controlled by the T. V. A. as its agent, around the lakes. For the most part these lands are confined to narrow strips purchased for protective purposes in order to allow the T. V. A. to control the shore line of the lakes. Much of the area of these lands now is in forests or abandoned brush and pasture land. While stretched out in long narrow ribbons, the sum total land area surrounding any one lake sometimes reaches considerable size. Preliminary surveys of wildlife and fisheries have been and are being made and suitable areas are dedicated to the particular wildlife development to which they are best suited. On the Norris Lake Forest an island has been set aside as a wildlife sanctuary; two areas have been indicated as "natural study" areas; one area has been selected as a special game refuge and one or two areas for game-management areas where efforts toward a high degree of detailed game management will be undertaken as a demonstration. On all of the rest of the lands of the Norris Lake Forest, as much consideration for the welfare of the wildlife and fisheries as is consistent with good forest management is the order of the day.

In the Tennessee Valley, as in most of the States of the Union, there are no large number of large natural lakes. The lakes created by the construction of the T. V. A. dams offer, therefore, an unusual opportunity for the development of fisheries and of wildlife intimately connected with large bodies of water. The Authority is proceeding slowly but carefully to do what it can toward making the most of wildlife possibilities.

Stream Improvement in National Forests

(By H. S. Davis, in charge, Aquicultural Investigations, U. S. Bureau of Fisheries)

There is probably no phase of fishery management that has received more attention during the past 3 or 4 years than stream improvement. Any development that promises to increase the supply of game fish will naturally appeal to the angling public, and it is therefore not surprising to find that stream and lake improvement has been almost universally accepted as a most important factor in the utilization of our aquatic resources. It is, however, unfortunate in many ways that stream improvement should have made such rapid strides in popular favor before we have the factual foundation on which this work must be based if it is to become a permanent and essential feature of fishery management. Although in one form or another stream improvement has been practiced for years in Europe, and to a lesser extent in this country, we must recognize the fact that it is still in the experimental stage and that we are sorely in need of authentic information as to its true value and the methods that may be relied upon to give best results.

The Bureau of Fisheries first undertook improvement work in waters of the national forests in 1934 under an allotment from the Public Works Administration. As far as possible the work was conducted in connection with stream surveys carried on at the same time in forests in New England, the Appalachian region, and the intermountain region. Under this arrangement streams were first covered by a survey party that recommended certain streams for improvement and also indicated the general character of the work required. These streams were then studied in more detail by a stream-improvement supervisor, who drew up plans for the improvements, which were installed later by C. C. C. labor under his supervision. This plan was found to work out very satisfactorily, although in some cases the work was somewhat handicapped by the fact that it was necessarily confined to waters within the vicinity of C. C. C. camps. Consequently it was not always possible to improve streams most badly in need of such attention.

Owing to the lack of funds, the Bureau of Fisheries was unable to continue stream surveys during the past season (1935), and were it not for the fact that the Forest Service employed men for stream improvement recommended by the Bureau this work would also have been discontinued. Under a cooperative agreement with the Forest Service, the Bureau continued to exercise technical supervision over the work as before, although owing to lack of personnel the supervision in some instances was necessarily reduced almost to the vanishing point. In general, the work was carried on in the same regions as in

1934, except that the program was extended to include the Pacific Coast States.

In this connection I wish to express our appreciation for the wholehearted and sincere cooperation the Bureau has received from the Forest Service. Without this assistance the work would manifestly have been impossible.

I have thought it advisable to present these details in order to bring out the fact that the stream-improvement work under this cooperative arrangement has not been confined to any one locality but has been carried on under a great variety of conditions in different parts of the country. For various reasons very little work has been done in lakes, although in some respects it is believed that they afford greater opportunities for improvement than streams.

In planning improvement work for waters in the national forests we have found the lack of basic information to be our greatest handicap. This absence of information based on experience is, if possible, even more noticeable in forest work than elsewhere since practically all previous work, both in this country and abroad, has been confined to the comparatively sluggish meadow type of stream rather than the swift mountain torrent so characteristic of the great majority of national forests. Such streams, subject to sudden and violent floods on the one hand and to extreme stages of low water on the other, present quite different problems than do the more quiet, meandering meadow streams. It was thus necessary to blaze our own trail to a large extent and modify old methods or develop new practices better suited to mountain conditions.

In the development of stream-improvement work in the national forests several guiding principles have been kept continuously in mind. First and foremost has been the belief that all stream-improvement work should be as inconspicuous as possible. There is, in my opinion, no justification for installing massive, incongruous structures that are a continual offense to the eye and a trial to the spirit. This is true especially in forest waters where the natural beauty of the streams should be preserved at all hazards. In thickly settled localities where ugly bridges, crib work, and other monstrosities mar the landscape, the construction of conspicuous dams and deflectors may be less open to criticism but even here I doubt if, in most cases, such structures are either necessary or desirable.

Not only should improvement installations be inconspicuous, they should also be inexpensive. It is very doubtful if expensive and elaborate structures are economically justifiable, especially when it can be shown that relatively inexpensive installations may be equally efficient. Much can also be done to keep the cost of stream improvement on a reasonable basis by seeing to it that the work is not overdone. Since the fish population of any body of water is definitely limited by the amount of food available, what justification is there for providing cover and shelter for many times that number, as has been done in not a few instances? No matter how badly in need of improvement a stream may be it is easy to reach the point where we encounter the law of diminishing returns.

Finally, we have proceeded on the assumption that stream improvement is primarily a biological problem and that this fact should be kept clearly in mind at all times. I do not mean to imply that the engineering aspects of the work should be disregarded—far from it;

but I do want to emphasize the fact that, no matter how closely the structures used may conform to engineering standards, unless they produce the biological results desired it would be much better if they had never been built. The purpose of stream improvement is to provide better living conditions for fish, and in the last analysis the value of any form of improvement work must be judged by the extent to which it will aid in producing this result.

For the average mountain stream we have found dams in one form or another to be more valuable on the whole than any other type of structure. Since these streams are often deficient in pools and are subject to the scouring action of frequent floods, structures are needed that will tend to retard erosion rather than accelerate it. Deflectors have also been utilized to advantage, but usually they have proved most valuable when used in connection with dams; otherwise there is great danger that constricting the current by this means will result in excessive erosion of the banks or stream bed that may do more harm than good. When properly controlled by the use of dams, deflectors may serve a very useful purpose in improving the circulation in pools, thus making them more attractive to fish and at the same time preventing them from becoming filled with silt and other deposits. These strictures, however, do not apply to the underpass deflector which appears to have great possibilities and is increasing rapidly in favor.

Several types of dams have been employed in mountain streams and the choice in any particular instance must be determined largely by local conditions. When the material for its construction is available I believe the rock dam is superior for most purposes to any other type yet devised. This dam is inexpensive to build and when properly constructed will withstand even the most severe floods. In the Pisgah Forest in North Carolina rock dams have been built of boulders weighing several tons that are as firmly anchored in the stream bed as the "Rock of Ages." In addition to its permanence and cheapness a most desirable feature of the rock dam is its natural appearance. In fact, after a short time these dams are frequently taken for natural structures, so perfectly do they blend with other boulders in the stream bed.

There are, however, many streams in which no large rocks are available, and in such cases some form of log dam will usually be found more satisfactory. In many instances a single log is all that is required, although where only small logs are to be had, it may be necessary to use two or more to get the desired height. If the bottom is soft and easily eroded, the log should rest on mudsills, but where the bottom is hard these may not be necessary. It has been our experience that the use of woven wire greatly increases the strength of the dam since it acts as an anchor to hold it in place, and there is also less likelihood that the dam will develop leaks. The wire should be buried in the gravel used to seal the dam and should nowhere be exposed except possibly where it is attached to the log. Ordinarily the weakest part of a dam is at the ends, and consequently the log should extend several feet into the banks and be protected by riprapping with stone. Our engineering friends are disposed to protect the ends with cribbing, but where stones are available I believe this is rarely necessary, and it certainly adds nothing to the appearance of the dam.

All dams, and other structures as well, should be kept as low as is consistent with the purpose for which they are constructed. If properly located, a dam 12 to 15 inches high will usually form a pool of sufficient depth and often even lower dams are all that is required. It should be remembered that stream improvement devices function chiefly during low water; at other times they are not needed except to provide a refuge from the swift waters of severe floods. Since low structures offer comparatively little resistance to flood waters, they are much less likely to be washed away than if built higher and are just as effective at low-water stages. When built of logs they are also less likely to decay than if frequently exposed to the air.

Probably no form of stream improvement affords greater possibilities than the use of check dams. These may be constructed in tributary streams to hold back silt or they may be used to impound waters which are allowed to flow into the stream at a uniform rate throughout the dry season and thus provide an adequate flow during this critical period. The use of check dams to produce a more uniform flow has proved very successful and has resulted in a remarkable increase of fish in streams which were formerly of little or no value for angling purposes.

But there is more to stream improvement than building obstructions. In fact, a considerable part of the work in national forests has been concerned with the removal of both natural and artificial barriers to the free movement of fish. In some regions it has been found that old beaver dams were doing great injury to the streams while in others old dams constructed for various purposes, but no longer in use, formed insurmountable barriers to ascending fish. In the Klamath Forest in California it was discovered that road culverts ending in a vertical drop of 10 to 30 feet barred the way to spawning salmon and steelhead and no doubt there are other localities where a similar condition is to be found.

The planting of trees, shrubs, and other vegetation to furnish shade and to beautify the banks has also been resorted to in some instances and is a form of stream improvement that deserves more attention than it has received in the past.

One of the most important lessons we have learned from two season's experience in stream improvement is that such work should be undertaken only by experienced men with some knowledge of biology and the life history and habits of game fishes, and with practical experience in construction. These requirements are the absolute minimum and of course a much more extensive knowledge and experience is greatly to be desired, especially if the men are to plan and supervise work on any extensive scale. No greater fallacy was ever promulgated than the not uncommon idea that any man equipped with an ax, pick, and shovel, can qualify for stream improvement.

It is evident that each stream is a problem in itself and that before undertaking improvement work a careful study of the stream as a whole is essential. In other words, stream surveys should always precede stream improvement. These surveys will serve to determine the streams most in need of improvement and the general type of work required. The ordinary survey, however, is not sufficiently detailed to furnish all the information needed and a more intensive study of each stream is necessary before the work is started. This

should consist of a careful examination of every foot of the stream to be improved, the designation of sites for all structures to be installed and the character of each structure. Even with all this preliminary work by trained men it is essential that the foreman of the construction crew have had considerable training and experience. No two structures even of the same kind are ever exactly alike. Each must be modified somewhat to fit the site where it is to be installed and this requires knowledge that can be gained only by experience.

It is also apparent that there is no need for a great variety of structures in stream-improvement work. A few comparatively simple types of dams, deflectors, and shelters are usually all that are required. Any experienced man with an average amount of ingenuity can make the modifications necessary to adapt them to different conditions. After all, there are only a few things that can be done to a stream to make it better suited to fish, and the use of a great variety of structures, as has been advocated by some writers, can serve only to increase the complexity of an already difficult problem. If one takes advantage of the possibilities afforded by a stream it is really surprising how much can be accomplished by simple, inexpensive structures when properly located. By taking advantage of tendencies in a desirable direction already present, and increasing the action of the water in this direction, a great deal can be accomplished with very little effort and without materially changing the appearance of the stream. Small, shallow pools can often be enlarged and deepened with little labor and probably will be more permanent than if built at a spot where there is no tendency to form a pool. Slight changes in the position of rocks or other obstructions will often provide excellent hiding places underneath or increase the erosive action of the current so as to form holes or small pools. This type of improvement may not attract much attention, but it is none the less effective.

In all improvement work too much attention cannot be given to the selection of the sites on which the various structures are to be built. It has been my experience that this is a point that is frequently neglected, although the effectiveness and permanence of any installation will depend to a very large degree on its proper location. A matter of a few feet up or down a stream, for example, may determine whether a dam will serve a useful purpose or whether it may be a complete failure.

Although stream-improvement work has been carried on extensively in national forests during the past 2 years, we still have very little authentic data which will enable us to appraise its true value. There can be no doubt, as I have already pointed out, that certain forms of stream improvement, such as the construction of check dams and the removal of obstructions, are of great practical value, but with the ordinary routine type of improvement the evidence is not so clear. That much of it is beneficial I do not question. The important point is how beneficial? To what extent will improvement work in any stream improve the fishing in that stream? I can no more subscribe to the views of those who claim it will prove of little, if any, benefit than I can agree with those who assert that in stream improvement we have the long-sought solution of the angler's problem and that it will do more to improve fishing than can be

accomplished by all our hatcheries, both State and Federal. The truth must lie somewhere between these two extremes, but just where is for the future to determine.

Although it is quite evident that stream and lake improvement may be an important factor in maintaining the fish population, until we have clear and authentic information with regard to its effect on fish and other aquatic life, we are in no position to render judgment on its value as compared with other phases of fishery management. There is no doubt that the value of improvement work varies greatly in different waters. Many streams require little, if any, improvement; others are of such a nature that any improvements that could conceivably help the stream would be so costly that we could not hope for any adequate return from our investment.

Between these extreme conditions there are a multitude of streams which can be helped in one way or another. Some require very little work; others a great deal; but with our present knowledge who is to say in any specific instance just how far we are justified from the economic standpoint in proceeding with the work. Most improvement devices are designed to furnish shelter and protection for the fish, and thus make the stream more habitable, but we do not know what devices are most efficient from the standpoint of cost and effectiveness.

With regard to the effect of improvement work on food organisms our information is still more fragmentary. Some writers seem to have taken it for granted that an increase in the amount of available food would necessarily follow, but I have yet to see any proof that this is the case. In fact, there are good reasons for believing that in some instances the net result has been in the opposite direction. The discovery of some practicable means of promoting the growth of food organisms is certainly a goal toward which we all should strive, but there is little evidence that much has yet been accomplished in this direction. In fact, it appears doubtful if it will be feasible to increase materially the number of food organisms in the average mountain stream, but in meadow streams and lakes there would seem to be much greater possibilities of success.

In view of these facts, it is evident that the greatest need today in stream improvement is a series of carefully controlled experiments designed to answer these and other questions which beset the improvement worker on every hand. The solution of these problems will be difficult and will require time, patience, and much hard work—often under very discouraging conditions. Nevertheless, it can be done, and in fact must be done, if stream and lake improvement is ever to be placed on a truly scientific basis. Owing to lack of funds and inadequate personnel, it has not been possible to undertake such experimental work on as large a scale as desirable. However, plans have been developed for conducting quite extensive investigations in this field and some of them are already under way. These studies will not be confined to any one locality, but will be carried on concurrently in several widely separated regions with a great diversity of stream conditions and will be conducted in connection with investigations on other related problems of fishery management.

Since the results of these studies will become available only gradually in the future, we are faced with the necessity of continuing

B17625

A, Elk in Niobrara Reservation, Nebr. (Biological Survey photo.)

B24130

B, Caribou buck in Alaska. (Biological Survey photo.)

B34486

A, Pintails in closed area of Lost Island Refuge, Wis. (Biological Survey photo.)

B33437

B, Canada geese and ducks on Sweetwater Lake, Sullys Hill Game Preserve, N. Dak. (Biological Survey photo.)

stream-improvement work on its present insecure foundation and hoping for the best. Naturally we should stress those forms of improvement which appear to offer the greatest possibilities of success rather than risk money and labor on work of more doubtful value. Most important of all, we should realize that stream improvement at best can form only a part of any comprehensive program of fishery management, and that if we are to conserve and develop our aquatic resources properly other factors must receive their due share of attention. Only by a well-balanced program, in which every factor in fishery management is utilized to best advantage, can we hope to provide satisfactory angling conditions in our forest waters.

(No discussion.)

Stream Improvement in Arid Regions

(By P. R. Needham, Ph. D., associate aquatic biologist, U. S. Bureau of Fisheries)

The major objectives of stream improvement are the improvement of shelter, food, and spawning conditions for trout, and to prevent excessive seasonal fluctuations in temperature and volume of flow. In the summer of 1935 the writer cooperated with the United States Forest Service in the direction of eight stream-improvement supervisors assigned to national forests in regions 5 and 6, covering California, Oregon, and Washington.[1] The experience gained as a result of the work of these men may be of interest to this conference in pointing out some of the advantages and disadvantages of stream improvement work in these areas.

The stream improvement supervisors spent 2 weeks in an intensive training period at a school held in the Cache National Forest near Logan, Utah, prior to assignment to various national forest areas. Every phase of stream improvement as it is known today was discussed and practical experience in actual work of installing various types of improvements was given.

After completion of the training period, eight of the 25 men who attended the training school were assigned to forest regions 5 and 6. Six of these were assigned to forests having typical west slope, Pacific drainage streams in the Olympic, Mount Hood, Siskiyou, Klamath, Lassen, and Tahoe National Forests. The remaining two men were assigned to forests having streams draining eastward in the Tremont and Inyo National Forests. This distinction between westward draining Pacific slope waters and waters draining east into the great interior basins is important because natural conditions and the stream improvement problems are totally different in each.

WEST SLOPE CONDITIONS

In west slope streams of the Pacific drainage, installation of standardized types of barriers, deflectors, or low dams were found largely unsuited to the conditions existing in these streams. Such streams in California, Washington, and Oregon are for the most part already well provided with shelter and their boulder strewn,

[1] The writer wishes to thank the officials of the Forest Service in these regions for the excellent help and cooperation rendered in all phases of this work.

rugged water courses make ordinary stream improvements cost far out of proportion to the results obtainable. Shelter is already adequate for the most part. Deep pools, cascades, shoots, and quiet backwaters are common. The percentage of fishable or "pool" waters is high. In west slope California streams the greatest draw-back is extreme fluctuation in water levels between wet and dry seasons. In the late summer and fall many streams go dry with consequent heavy losses of trout. The California check dams described later in this paper have been developed to remedy such conditions.

In Washington and Oregon the danger of streams drying up in late summer or fall is slight due to the much higher annual precipitation received on the west slopes of the mountain ranges in these States. Extremely high run-off in winter and spring offers the greatest obstacle to the installation of standardized types of improvements. The lower reaches of coastal streams usually contain bars of shifting sand and gravel that do not permit of permanent construction without excessive costs. The upper portions at higher elevations flowing over rocky beds of steep gradients are for the most part already well supplied with good natural shelter as noted above.

IRRIGATION AND POWER DIVERSIONS

In the experience gained last summer it is the opinion of the officials of both the Forest Service and Bureau of Fisheries that the most practical improvements that can be undertaken in west slope waters of Oregon and Washington are the screening of irrigation and power diversions and the removal of barriers to upstream migrating salmon and steelhead.

Millions of young seaward migrating steelhead and salmon are lost annually due to unscreened irrigation ditches through which they pass to become fertilizer on fields and orchards. While losses due to power diversions may be somewhat smaller, nevertheless the harm done is sufficiently serious to warrant screening of these diversions as has already been done in many instances. Only a very small fraction of the number of irrigation ditches in the Pacific Coast States have fish screens. A definite program for screening all types of diversions whether on public or private land should be adopted and backed by adequate funds for legal enforcement and proper operation and maintenance of same in all waters possessing sea-run, migratory trout, or salmon.

REMOVAL OF BARRIERS TO MIGRATION

In many streams are found old abandoned mining dams or low falls that prevent both salmon and steelhead from reaching good spawning grounds in their upper waters. Much good work last summer was accomplished by the Forest Service using C. C. C. labor in blasting out and opening up such barriers. Dams still in use are often shown to have inadequate fish ladders or none at all and such should be supplied where feasible and where good spawning beds lie above. As for natural low falls, it is a needless waste of funds to remove such barriers where no spawning grounds occur above. Even if spawning grounds are available above, falls of great natural beatuty should not be desturbed but should be left

for the asthetic enjoyment of the people. Droughts in past dry seasons have prevented upstream migrations over falls that were formerly passable when greater volumes of water flowed over them.

EAST SLOPE CONDITIONS

East slope conditions in forest regions 5 and 6 warrant entirely different treatment by reason of the prevailing different conditions. Here the run-off is more even from season to season, the streams in general are smaller, and the gradient of the stream beds are lower, offering considerable opportunities for the installation of standardized types of improvements. Improvement work carried on under the direction of Dr. A. S. Hazzard, in the intermountain region in 1934 and 1935 clearly demonstrated this fact. Another fact, too, that justifies improvement work in arid or desert regions of this type is the general scarcity of good trout streams. Everything possible should be done to maintain those that can and do produce good trout fishing. Streams draining the eastern slope of the Sierra Nevada Mountains in California have been greatly improved by the use of low boulder dams, the rocks for which usually are found close to the sections needing improvement. Low one- or two-log or pyramid-log dams have likewise been used with apparently permanent success. These streams are very heavily fished and it seems to the writer that one criterion that should be used in deciding whether or not stream improvements should be placed in any given stream that offers possibility for improvement is just this, intensity of angling. To improve remote, inaccessible streams that are fished but little even though they offer considerable opportunities for improvement would be an unnecessary waste of funds. While it has been said that stream improvements are intended for the benefit of the trout alone, nevertheless it seems evident that we can justify such work in the long run only on the ultimate good to the anglers who pay the bills.

It has been shown from the foods investigations of the writer and others that the riffles are the food-producing areas in streams. Streams containing mostly riffle space and lacking in deep pools for shelter will, on the average, produce only small trout. The ideal stream from the standpoint of the trout and the angler together would offer frequent pools interspersed with frequent riffles. Such conditions provide good shelter as well as good food conditions. To break up riffles entirely into a series of pools is to unbalance the stream in relation to food and shelter. Both are equally important and both must be provided for.

Lack of space here prevents discussion of the various types of structures used, but a few words on their appearance in streams might well be said. Conspicuous dams and cemented structures will give streams a wholly artificial appearance unworthy of good trout waters. Where boulders, logs, stones, or other natural materials along the stream are carefully utilized, it is quite possible to put in effective shelters and at the same time preserve a natural appearance. No one, I think, cares to see concrete, log, or stone dams, arranged in neat, park-like order on a stream. Such installations are useful in hatchery rearing pools, but are out of place on natural trout waters. Improvements can do a stream more harm than good if

installed under inexpert guidance. No one wishes to see the natural beauty of his favorite stream spoiled.

CALIFORNIA CHECK DAMS

In the Sierra-Nevada Mountains in California a splendid type of stream improvement to control excessive seasonal fluctuations has been developed, which is proving to be a tremendous boon to angling. As noted above, streams draining westward from the Sierra Range are already well provided with shelter. Their principal drawback is tremendous seasonal fluctuations in volume varying from extraordinarily high water in the spring from melting snow and ice to a very low run-off or none, in many streams in late summer and fall. Very few streams of the south or central Sierras in California are fed by springs of sufficient size to maintain even flows the year round. As noted above in those streams drying up periodically enormous losses of trout occur annually. Briefly, the plan calls for the construction of small check dams at the outlets of headwater lakes for water storage. The water is then released in the dry seasons of late summer and fall, thus maintaining permanent stream flows below the lakes dammed preventing heavy losses of trout. Ambiguously enough, in this case, lake improvement becomes a direct means of stream improvement.

In the high Sierras there are hundreds of headwater lakes at elevations from 7,000 feet to over 12,000 feet that offer narrow, V-shaped glacier cut outlets for cheap dam construction. Many lie at the headwaters of permanent streams, in which case dams are not required. The greatest good is accomplished in damming lakes that will furnish water for permanent flows over inlet or outlet spawning beds of lakes lying at lower elevations in the same drainage systems.

In 1931 five check dams were constructed as a test project, on lakes at the headwaters of Cherry Creek[2] a tributary of the Tuolumne River just north of the boundary of Yosemite National Park. Before the dams were installed, sportsmen who fish this area were greatly perturbed about the heavy annual losses of trout and now, since the check dams have accomplished such a fine job, they are wondering if the trout population is becoming too heavy for the food supply. The five Cherry Creek dams cost an average of $1,040 apiece and the approximate average cost per acre-foot of water stored was $1.70.[3] Granitic sand is usually found close to the dam sites and concrete, pipe, tools, and supplies are packed in on horseback. Boulders and rocks are used in the masonry type of dams constructed.

HOW THE DAMS WORK

At the time of construction, an 8-inch iron pipe with regulating valve is placed in the bottom of the dam. Operation of the valve is regulated by means of a rod extending from the valve flush with the top of the dam on the upstream side where a padlocking device prevents unauthorized persons from changing the size of the open-

[2] Mr. Fred Leighton, conservationist and sportsman of Sonora, Calif., was largely responsible for initiating the Cherry Creek work, the first of its kind to be attempted in California.

[3] Lakes under 15 acres in area should never be used in check dam work as the amount of possible storage in lakes smaller than this is often insufficient to provide water over total dry periods in late summer and fall.

ings. Eyebolts embedded in the dam protect the rod from being knocked out of place or bent by ice or floating logs. Wire screen placed on supports at the pipe opening on the inside of the dam prevents debris from settling and clogging the opening. In winter and spring, melting snow fills the lake and flows over the top of the dam. After the lake level has fallen below the crest, water continues to feed into the stream below through the bottom pipe.

In the fall of 1933, when I looked the lakes over, no more than about half the water stored had been utilized even though a fine flow had been maintained from them all summer.

Later two more check dams were constructed by the National Forest Service with the help of C. C. C. boys at the headwaters of Clavey Creek, the next good-sized tributary of the Tuolumne River northwest of Cherry Creek. The upper portion of this stream used to go dry annually causing large losses of trout. These two dams together store about 420 acre-feet of water and supply about 20 miles of stream including several miles of fine natural nurseries and spawning beds with water the year around.

SYSTEM IS SELF-OPERATING

The fine thing about this type of stream improvement is that it is self-operating. Once the dam is in and the outlet valve adjusted, no further attention is required except for an occasional check-up. The intensity of fishing is light in the Cherry Creek drainage and its lakes, due to its comparative inaccessibility, and with natural spawning aided by stream flow maintenance, the trout supply of those lakes and sections of stream lying below lakes with dams has become entirely self-maintaining. No expensive stocking with hatchery-reared trout via pack train should be required unless the intensity of fishing becomes far heavier than it is now. The dams are steadily paying for themselves from year to year in adding large numbers of trout to the present population.

As for the very headwater lakes, themselves, these will require restocking to maintain fishing in them. Many of these were barren of fish originally, due to numerous high, natural falls which prevent fish in the streams below from entering them. Further, most of these uppermost lakes lack spawning grounds or streams above them, and in all probability natural reproduction will not be sufficient to keep them supplied with a good stock of catchable fish. In any case, stocking with hatchery trout should not be necessary. Small, naturally spawned trout are exceedingly abundant in the streams below and doubtless some of these can be netted and planted in the upper lakes each year at little expense and without great effort or serious detriment to the streams.

The Cherry Creek dams, constructed in 1931, have conclusively demonstrated the great value of this type of improvement work in areas lacking sufficient rainfall to provide permanent flows of water.

SPAWNING BED IMPROVEMENTS

While the check dams described above are a direct means of improving spawning conditions in semipermanent streams, what can be done to improve spawning conditions in streams having good, permanent water supplies?

It would seem logical to assist nature in every way possible so that maximum contributions of naturally propagated trout may add the fullest possible quota to the fish supply of both streams and lakes. I believe this phase of improvement work to offer considerable potential possibilities once the requirements of trout in this respect are fully understood, and once really practical methods for providing same are developed for waters lacking natural spawning areas.

In England artificial gravel spawning beds have been constructed by dumping in loads of gravel in shallow-water areas of streams though I do not know of any published accounts of the success obtainable with this method.

Hubbs, Greeley, and Tarzwell say:[4]

> It is, of course, advantageous to supplement the stocking of such streams with natural production. We have already pointed out that, by the use of current deflectors, the sand can be washed off to expose gravel suitable for spawning in some such streams. When this may not be done, and no spawning facilities are available, gravel beds may actually be added. This should be done, for either brook or brown trout, in headwaters which do not freeze in the winter, when the eggs are developing (streams which remain well below 60° F. in hot summer weather will seldom, if ever, freeze over in winter). The best gravel is rather coarse and loose. Natural gravel where too firm to allow the trout to dig out the spawning pits may be made suitable for spawning by turning over the gravel with a fork, or better with a spike-toothed harrow drawn by a horse.

Here, too, no mention is made telling whether or not such improvements are successful in terms of naturally spawned trout. It boils down to the fact that we know practically nothing about this phase of improvement work. This problem presents an opportunity for some extremely useful fact-finding research.

In California, Fred Johnson, of the United States Forest Service, region 5, started experimental work along this line in the inlet to Medicine Lake in the Shasta National Forest during the summer of 1933. This work was the first of its kind in the Far West. To date, while spawning fish have been observed using the artificial beds provided, no accurate quantitative determinations have been made of the resultant young produced in such beds. In the summer of 1934 and 1935 Johnson directed similar improvements in Gumboot and Castle Lakes also in the Shasta National Forest, but no clear-cut conclusions are possible of any of the work done to date.

Lakes in the high Sierras and Rocky Mountains often lack suitable inlets or outlets for spawning purposes. Sometimes impassable falls prevent fish from reaching suitable spawning beds, in which cases, where the falls are low, a few shots of dynamite will often clear a way permitting their ascent. Unless good spawning grounds do exist above any given obstruction there is absolutely no point in removing them. In many high lakes in California where spawning inlets are entirely lacking or inadequate, rainbow, golden, and loch leven trout will spawn in the lake outlets or descend them, often passing down steep, rock-strewn cascades to their destruction. In such lakes means permitting safer spawning would certainly seem desirable.

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[4] Hubbs, Carl L., John R. Greeley, and Clarence M. Tarzwell, 1932, Methods for the Improvement of Michigan Trout Streams, Bull. Institute for Fisheries Research, no. 1, University of Michigan, p. 45.

IMPROVING FOOD SUPPLY OF LAKES AND STREAMS

This phase of improvement work is one that has received little attention in this country to date though many sporadic attempts to improve food conditions of various waters has been tried by a few sportsmen, clubs, or other agencies. In England, however, intensive care and management has been given trout waters for generations and we have much to learn from the experience gained there. Much of the English work has had to do with the introduction and improvement of trout foods.

I have been asked many times regarding the success obtainable by introduction of various aquatic food organisms into trout waters and the answer to this question depends entirely upon what specific food organism is to be introduced, whether or not the waters it is intended for are suitable, and whether or not it is already present. Much money has been wasted in attempting to stock waters with food organisms which failed to thrive.

Aquatic insects will be found well distributed in practically all waters suitable for them and to try to introduce stoneflies, for instance, from one drainage area to another is a pure waste of time, for adults being winged, would probably have already established themselves had the environmental conditions they require been suitable. For instance, nymphs of the large salmon-fly (Stonefly, *Pteronarcys californica*) are abundant in streams of the central and northern Sierra Nevada Mountains in California and, so far as we have been able to determine, are absent from southern Sierran streams such as the San Joaquin, Kings, Kaweah, and Kern Rivers. Adult salmonflies are winged forms and would probably occur in these streams naturally had conditions been suitable. The reason for their absence is very probably due to lack of much decaying organic matter such as leaves, bark, and twigs, upon which they normally feed. Spring floods of the more southerly Sierras pulverize and destroy such materials through the grinding action of granitic sand and smaller stones carried by high waters. More stable seasonal conditions exist in northern California streams, with the result that greater amounts and kinds of foods for aquatic organisms remain in the stream beds. This is probably a major reason for their greater richness in food organisms.

Nonwinged forms such as shrimp, crayfish, snails, or forage minnows, which must depend for the most part upon water courses as their means of distribution, can occasionally be introduced with success, but only careful biological investigation will reveal the practicality of this procedure. In order to avoid the danger of introducing harmful forms which might upset the biological balance existing between the fish and food supply already present, thorough preliminary surveys of the waters concerned should be made by competent biologists.

Claims of success in the introduction of shrimp and other organisms are often made, yet preliminary investigations are seldom indulged in to find out whether or not such foods are already present. To attempt to re-stock with trout foods without attempting first to find out what is already there is putting the cart ahead of the horse. Careful analysis of local conditions should always be made first.

Then, as usually is found, a bit of aid to nature in providing better conditions for foods already present will often save much money that is wasted on poorly adapted foods that fail to establish themselves.

In summary, insofar as stream improvement work in California, Washington, and Oregon is concerned, it is the definite opinion of the writer that the bulk of such shelter improvement work should be concentrated in the more arid, eastern portions of these States. Barrier removal, check dam, food and spawning-bed improvements can well be carried on in both portions, and all methods, as we know them today, however experimental they may be, should work to the ultimate good of trout fishing in these regions.

The simple A B C of all improvement work is to make trout comfortable by meeting in the fullest measure possible those fundamental requirements of adequate food, shelter, and fit conditions for reproduction.

Planting Food for Fish

(By Carl L. Hubbs, Curator of Fishes, University of Michigan)

In the very brief time allotted for this discussion of "Planting food for fish", I will attempt little more than to recount the results of a few experiments, to state some of the problems involved, and to use these statements as the basis for a rapid analysis of the present status of the field of fresh-water fish management in general.

The idea of planting food for fish is indeed definitely in line with this most recent development in fish and game administration and research, namely fish and game management. This development has come to the fore with the conception of fish and game as a crop which can be increased by cultivation; with the realization that environmental factors limit the crop, and that the environment may be altered to multiply the crop. The principle of modern fish and game management is to discover what factors are limiting the particular wildlife crop which should be increased, to learn how to modify these factors for the benefit of the desired crop, and to put this learning into practice.

The amount of available food, of the right sort, without question is very often a factor of prime importance in regulating the population of game fish. Without sufficient nourishing food, increased natural reproduction, or augmented fingerling stocking leads to dwarfing or even starvation. Under the same conditions, more effective shelter for the young game fish has the same effect, saving more mouths to take a share of the insufficient food supply. An abundance of natural food, other factors not being too adverse, leads, on the other hand, to a large production of game fish. The experience of fishery researchers, published and unpublished, is already crowded with examples of the dependence of game-fish production on both the quantity and the kind of natural food.

The modern fish manager, on learning that the crop of a desired game fish in a given lake or stream is being limited by the small amount or improper kind of natural food available, again asks his oft-repeated and favorite question, "What can be done about it?" The answer may be to increase the production of the natural food organisms already present, by such means as fertilizing the water

with superphosphate, or providing more slabs under which certain minnows spawn. Or the answer may be to introduce, or plant, some food animal not already present, which may be expected to become established and to multiply sufficiently to support a larger game fish crop, but which will probably not in itself become a nuisance.

An example of success in the planting of fish food has been claimed by Coleman, working for the California Division of Fish and Game. He has indicated that the success of stocking trout in certain small, previously almost completely barren, mountain lakes is the result of the prior planting of scuds, scientifically called amphipods, popularly misnamed "shrimp." Similarly the striking success attained in stocking the previously barren Crater Lake in Oregon is attributed to the introduction of similarly small food organisms, as well as crayfishes.

Examples of failures in the planting of the so-called fresh-water shrimp may also be cited, especially in the East where the distribution of this valuable trout food organism has been commercialized for several years. The Huron Mountain Club of Michigan bought some hundred thousand shrimp and distributed them through nearly all of their waters. In later making a survey of the lakes on this club, I located scuds in only two lakes, which were the only ones in which these animals were not planted. Furthermore, the species I found was different from the one planted, and had doubtless been in the club's waters for centuries. Technical competence is obviously needed in recognizing the value of introducing food organisms, in recommending a food stocking program, and in checking the results of planting experiments. Behind this technical competence must lie new researches to determine the natural conditions which are tolerated by various food species, and those conditions which are especially conducive to the natural multiplication of the food.

It has been indicated by Kendall, venerable fisheries investigator of Maine, that land-locked salmon have succeeded only in those lakes in which their natural forage fish, the smelt, is either native or introduced. No doubt some introductions of this forage fish have been very beneficial. Other attempted introductions of smelt, for instance into lakes of the Sawtooth Mountains in Idaho, appear to have been fruitless. Another planting of the smelt, into Crystal Lake, Mich., may well have been entirely too successful. From this source the smelt, freed from its natural parasites and enemies, has spread and increased at an almost unbelievable rate, until now a large portion of the Great Lakes teems with this rather predacious and hence at least potentially dangerous forage fish. Great excitement accompanies the much advertised smelt runs, which for a few years were confined to the little Cold Creek, tributary to Crystal Lake, but which now attract thousands of fishermen and much money to many northern communities. In some places, as in Lake Charlevoix, the smelt seem to be fulfilling the purpose for which they were introduced, namely, filling the guts of salmonoid fishes. Elsewhere, particularly in Green Bay, the swarms of smelt alternately bring good revenue to the commercial fisherman, and seriously hamper their operations. To what degree the smelt, with their big, strongly toothed mouths, destroy the young of the native commercial fishes of the lakes is yet unknown. It remains to be determined whether

this introduction of smelt into Great Lakes waters has been a blessing or a curse. Obviously the uncontrolled spread of the smelt sounds a warning against unintelligent fish management.

The need for forage fishes and the value of stocking them where absent is well shown in connection with the use by Iowa of shallow lakes as pike-perch nurseries. Enormous productions of fine fingerling and older pike-perch have been attained, when these lakes were supplied with forage fishes. After the minnow population was destroyed by the predacious young pike-perch, the minute organisms ordinarily fed upon by the minnows increased inordinately, finally dying so suddenly and in such abundance as to deplete the oxygen and kill the pike-perch. Success has again been obtained after restocking these lakes with forage fishes.

Some forage-fish stocking has been done in Michigan. Several species of minnows have been planted in lakes deficient in food for large game fishes. At least a small measure of success has been indicated. Mr. Gerald P. Cooper, who is contributing a discussion on the importance of forage fishes in this session, has found that the Great Lakes shiner, which has been experimentally introduced into some of our smaller lakes, is reproducing in some of the inland waters. Should it be found that this fish will adjust itself to and multiply in certain types of interior lakes, we will have a seemingly unlimited supply of shiners for stocking these waters, because this species swarms in the Great Lakes as sardines do in the sea.

The planting of natural food, promising as it seems to be, is by no means yet to be regarded as a thoroughly established, beneficial practice. One very possible danger, often overlooked, is that of unwittingly introducing serious parasites which live during one stage of their life cycle in the food organism and spend a later stage in the body of the game fish which eats the disease-carrying food organism. The planted food organism may seriously compete with game fish, especially the young game fish, for food. Creaser showed that crayfish in trout streams eat much the same food as trout. A true freshwater shrimp, which has been considered as a forage animal possibly suitable for culture, has lately been shown to feed largely on snails, which fishes also eat. The lowly flatworm I have observed to be a great destroyer of *Daphnia*, which is a staple food supply for the young of many fishes. Cooper has shown that minnows in general can feed on bass fry. The depredations of minnows on the eggs and fry of basses and sunfishes, when the guarding males have been frightened off their redds, has often been observed. The suckers, and the muddlers or freshwater sculpins, are egg predators, as well as fine forage fishes. Young carp often provide an abundance of bass food, yet old carp may more than overbalance this benefit. Extensive harm might conceivably be done by planting any of these food organisms in new waters. Whether the harm accomplished by the introduced organism will overweigh the benefit it will provide as food for game fishes is difficult to predict in advance, or even to determine afterward, because the question involves a fine and complex balance. In general, I believe, the effect will prove to be beneficial.

All of these problems clearly call for more information, more research. These problems of food relations are much more difficult

for the investigator in fish management than for the researcher in game management. Nearly all freshwater fishes, including most forage fishes, and even a very large proportion of the minute, invertebrate food organisms are to some degree predators, at least on fish eggs and fish fry. Almost all game mammals and birds on the contrary are herbivorous: moose, elk, deer, sheep, mountain goat, rabbit, pheasants, quail, grouse, nearly all valued ducks, for example, feed on plants, have a very simple food cycle, and do not eat one another. Fishes in contrast take part in extremely varied and extensive food chains, complicated by such relations as that of the pike-perch feeding on suckers which in turn feed on pike-perch eggs.

There is only one common American freshwater fish which typically short-cuts the food cycle by feeding directly on plant life. This is the gizzard shad, which strains the microscopical plants out of the water and then serves as a direct link between plants and game fishes. The extraordinary value of the gizzard shad as a forage fish is determined by this simple food relation, as well as by its extremely prolific reproductive capacity. Ohio and Illinois, appreciating the forage value of this fish, introduce it into new reservoirs before stocking these waters with game fish. To some degree the gizzard shad may also feed on game-fish fry; to what degree calls for inquiry. All other recommended forage fishes are more open to criticism as possible fish predators, at least on fish eggs and fry.

The problems of providing food for game fishes are thus fraught with a multitude of serious questions. Fish investigators of the new fish-management field grope about with these problems as though walking in an underground maze, often cracking their heads on walls of ignorance which block their progress. With enough manpower these walls can be broken down.

The dangers in planting food which I have purposefully emphasized can be avoided when the food relations of our freshwater animals are thoroughly learned. As a whole, even without this fuller knowledge, most efforts along this line have been beneficial.

The success which fish management can attain in achieving its objective of increasing the supply of game fish is being greatly limited by the small number of investigators in this field. A very few men, mostly burdened with other duties, are striving to bring aquiculture into line with agriculture, the problems of which are being constantly attacked by a veritable army of investigators. In order to solve such problems as the one that we have discussed—how to increase the natural food supply for the fishes in our lakes and streams—we need several freshwater fishery experiment stations and several score of researchers.

We have scarcely more than monkeyed with these problems. We can record a moderate amount of research on the problems of natural trout food and its production; scattered statistical researches into the natural production of food organisms in lakes and streams; very little study on the methods of increasing the food supply; almost nothing on the possibilities of increasing the natural food by planting food organisms; a few good researches left disconnected, uncoordinated, and unapplied; a dribble here and a dribble there.

Instead of establishing a chain of interior research laboratories to facilitate the attack on such pressing problems, the U. S. Bureau

of Fisheries has abandoned its one real fresh-water fisheries laboratory (for good reasons, I understand). What interior research work the Bureau is doing, outside of its two experimental trout hatcheries and the hurried and relatively superficial studies connected with stocking policies and stream-improvement work in the national parks and forests, is largely related to commercial fishes. This work includes the exemplary surveys and researches by Ellis on the basic problems of silting and pollution and the very useful researches of Van Oosten and his staff into the commercial fish problems of the Great Lakes, but scarcely makes an impression on the problems ordinarily considered under game-fish management. A few researches, basic to the development of fish management, including particularly the problems of increasing the natural food supply, are being conducted by the States, especially Wisconsin, Illinois, New York, and Michigan. But these State investigations, as well as the Federal investigations, are largely isolated and unapplied.

Both the Federal and the State agencies must greatly expand their research and administrative work in the new field of fish management if this field is to be developed on a sound basis and to a degree which will be really effective in stopping the depletion of our game fish, and in eventually attaining the goal for which we should all have the courage to strive, namely, that of very materially increasing the game-fish supply. This will demand a replacement of the often crazy conservation which has been rampant here in Washington during the last few years with a sound, permanent organization. This new organization would also be a very costly one but one abundantly justified, not only for current economic returns but also for the insurance of a finer America in the future. Incidentally, there are still some of us who think that it would be quite appropriate for this generation to pay the bill, for we shall reap the current benefits and should be happy to present the future benefits to our children rather than to hang a still heavier burden onto their necks.

Stream Improvement as Related to Erosion

(By Robert Ritzler, *Dayton, Ohio*)

It is a well-known fact that in the agricultural Middle West many of our streams are made shallow and unfit for game fish by erosion, caused, in turn, by deforestation of banks and the ditching of fields. However, to these abuses of nature has been lately added the straightening of small rivers and creeks by dredging, therefore causing a quicker run-off of waters and an immeasurable increase of bank erosion.

Engineers claim that quick run-off prevents floods, but the investigations of scientists, sportsmen, and conservationists generally seem to prove the exact opposite. And if the dredging of streams from bank to bank does not prevent floods, it has no reason or defense, because it can be proved without question that it is the most effective way to waste water, a great natural resource, and that it is a huge erosion-creating means.

County officials, State departments, and now the W. P. A. are the agents of this destruction—although, strangely enough, the United

States Soil Service, the Biological Survey, Forest Service, and other branches of the National Government declare against such practices in no uncertain terms.

And so the fisherman and outdoor lover cannot be accused of selfishness when they protest against the loss of their fishing pools by dredging and the destruction of beauty by the complete denuding of streambanks of their trees. These people are really fighting for our two most valuable natural resources, soil and water. True, they stand to benefit by a little recreation; but surely no one would begrudge them that, since the benefits to everyone are so great.

An enthusiasm for fishing led the writer to a study of conditions in the streams and a consequent series of experiments in the betterment of existing fish-life environment. It was but a step from there to a deep interest in soil-erosion prevention.

Significantly, he discovered that there were certain means of controlling bank erosion while, at the same time, improving fish habitats in the stream. Briefly, they may be classified as current deflectors, brush or stone revetments, erosion dams in the gulleys emptying into streams, log shore lines, and, in some cases, the actual rebuilding of badly cut hillsides bordering the water.

There is labor to waste today and money to pay for it. The saving of our soil and water is undoubtedly of paramount importance. Why not put this manpower and money to use in conservation, instead of destruction?

I am sorry to say that the statistics at my command prove that for every conservation project there are about five anticonservation projects carried on by State, county, and national departments of government. This represents a net loss—and no conservation in total.

I therefore recommend to the Federal Government, which furnishes most of the funds, that a central control be established and an end put to the present policy of nullification of effort.

To repair the damage already caused by man's carelessness in the deforestation of stream banks and ditching operations will take years and millions. But to restore the present organized and wholesale deforestation of banks and stream dredging will cost billions. The cost, in reality, would be too great to receive serious consideration. The only sane thing, it seems, would be to count these devastated areas as lost, until nature can rehabilitate them in fifty to a hundred years. But we need not go on destroying. Restoration is an expensive process in comparison to conservation.

Stream improvement, as the term has been accepted, means to the sportsman a method of increasing the fish-carrying capacity of the stream by the building of devices, such as dams, various kinds of deflectors, and covers. It is further accepted that only natural rivers and creeks can be improved in this way. The task of reclaiming a dredged and completely deforested stream would be almost an impossible one.

However, it costs no more to combine the restoration of a partly damaged stream with the usual stream improvement works for fish betterment. By that, the writer means, of course, a stream that has been hurt, here and there, by an occasional landowner cutting the trees or by natural causes. For instance, where a bank has been eroded, particularly at a bend in the stream, a deflector or

brush-heap can be installed, which will serve both purposes of allowing the shore to rebuild and furnishing a new pool for the fish. (Deflectors, by concentrating the current, dig a hole in the stream bed—only it will be at the tip of the device not at the shore line.)

Such simple devices as, for example, the following brush construction, will rebuild banks by current action: Good-sized willow cuttings with all the branches left on them are driven into the bank laterally and extending at about a 45° angle into the stream; they are then wired tip and butt, to pipes or hardwood stakes, driven several feet into the stream bed. The obstructive tendency of the many small branches is just enough to slow down the current immediately alongshore so that silt is deposited, and the strength of the trunks great enough to catch and hold any loosened portions of the bank.

The best way to accomplish one's purpose in this sort of brushwork is to use live cuttings only and to plant them safely below the damp mark of low-water stage. As willows had best be planted in late winter or early spring, this means putting them in below water at that time, if they are to grow and therefore rebuild a permanent bank.

The principle envolved in these forms of stream improvement and soil saving is that of taking one's cue from Nature—not running counter to her, as the engineers are doing in their more mechanical ways. For, as an experienced conservationist remarked to the writer just the other day, the planner must have some "stream-sense", a faculty only to be gained from years of observation along the stream, and not from the study of textbooks alone. Because, after all, the best that others can give us, in this regard, is the theory. Each and every stream is a problem in itself. We must know Nature's book, too.

One thing that can be taken as final, however, applying as it does to all flowing waters, is that when the trees and shrubs are removed from a stream bank, as misguided public officials have been removing them on a vast scale, that stream becomes a great potential factor for flood, drought and erosion, and the homes of the fish are utterly destroyed. In other words, it can be stated as an axiom that the fringe of vegetation on our waterways is the last line of defense against desert conditions.

DISCUSSION

Dr. Hubbs (chairman). What can be done to stop excessive and unwise drainage? I have a suggestion to make—that we go on record here, and ask the conference to go on record, in urging that every State drainage or flooding project require the approval of the State department of conservation or other appropriate State agency; that every such Federal project, whether of relief or ordinary nature, require the approval of the Bureau of Biological Survey and the Bureau of Fisheries; that State legislatures and Congress be advised and urged to enact the appropriate legislation; that the several conservation agencies be urged to employ adequately trained men to investigate all such projects, with an eye to the biological consequences. I want to ask for a rising expression on this point. Those in favor, rise. [All stood up.]

General Discussion

(The chairman asked that general discussion be held over until the last of the meeting on account of time.)

Dr. John R. Greeley (New York). It seems to me in looking back on the papers, that they are all playing pretty much the same tune with all sorts of variations, but the main point brought is environment. We should utilize nature, and not work against her. There are still a number of things that need a great deal of work. I think that Mr. Ritlzer's discussion was very much to the point on that. We are fixing up throughout the country streams which we can control, but in various areas they are not controllable at present. There are large areas of land under the supervision of nonexperienced landowners who may or may not apply management. I think that after hearing Mr. Ritlzer's discussion one would think twice before cutting away forests to make more crop land. I would like to point out the educational aspects of this thing in a little more detail. Not all work is Federal. It is a point that needs a great deal of constant shoving if we are going to get streams in the best shape we can get them. There is a great deal of work to be done here.

Dr. Agersborg referred to the great value of reforestation.

I. Danna Kahle (Knox, Pa., Senate of Pennsylvania). I would like to add a word or two in regard to Mr. Deibler's talk. In Pennsylvania, we have many mountain streams, I believe the most beautiful in the country. But we have things today that are polluting those streams. Mr. Deibler brought out the question of mines, but did not tell you what was going on. In Pennsylvania today the work has been brought before the legislature—I being a member of the legislature and know about it—and that is this: An ounce of prevention is worth more than a pound of cure. In the early days when locating industries, and so forth, they would seek the country that was the most wooded, where they could get wood for pulp the cheapest. Today those industries are throwing acids, and so forth, into the streams and destroying natural conditions of streams. This has been brought before the legislature. We find that these industries, most of them, are working with us in trying to establish some way to bring forth that ounce of prevention. Today in 22 counties in Pennsylvania, we are sealing the old mines. The W. P. A. administrator has set aside $1,500,000 to be used for that purpose. But the question is, What are we going to do with the mines that are working today? The great coal-mining owners are working to try to do something to prevent this pollution, and when we can establish the prevention—not let our streams get polluted—we can get further than trying to clear up the pollution after it has been so polluted. We hope to go further, even so far as tanneries and paper mills. We cannot turn these people out, because they mean a livelihood to so many. But they are working with us, and I am sure that in the near future something will be worked out whereby pollution by those industries will be taken care of and at the same time not hurt the industry.

The Chairman. There is a session on pollution on Thursday morning, in which those problems will be discussed.

Kenneth A. Reid (Pennsylvania). I would like to ask about one phase. One of our problems, and this is not confined to Pennsylvania alone, but to Eastern States, is the matter of controlling water temperature below headwater dams by underpassing the water. Any large dam on a trout stream will make matters worse because it will raise the temperature. Water 10, 12, or 20 feet down is colder. I had one opportunity to demonstrate dams in Center County, Pa. The river was too warm. Suggested and got an underpass for that water. After this was done in July, I took the temperature over the spillway and the temperature out of the underpass, and the difference in temperature was 11 degrees—underpass 11 degrees colder than over the top. As to correcting the low stages of water, that would be done by a regulating valve.

Mr. Davis (U. S. Bureau of Fisheries). It has been shown that we have the problem of temperature control. In the West it has been shown that we can cool the water by allowing it to drop over the dam. In some places where it is desirable to increase the temperature, it would be best to spread the water out.

Charles O. Hayford (Hackettstown, N. J.). We had a most interesting thing in New Jersey. We built a dam, impounding a body of about 10 acres. Took temperature, and found out that it raised the temperature 12 degrees. It is very important to hold stream temperatures down by pulling from the bottom instead of from the top.

Russell Lord (U. S. Bureau of Fisheries, Pittsford, Vt.). It is all right to have your dams and cool water, but we have to watch out for depletion of oxygen. How long does it take water to flow to become sufficiently aerated for fish?

One thing that stream improvement does is practical. It spreads out the fishing places. Any trout stream has its favorite fishing spots. You will find the same holes fished time after time. If stream improvement does nothing more than to make more places to fish and relieve the intensity of fishing in spots, it will allow trout to spread out. Shelters are practical. We have found that a large flat stone would be used for shelter by fish, even before the crowbars were removed. About 10 days after we had covered a considerable section of a stream, I hooked five trout that went under these newly formed hideouts, and to get them out had to put up my sleeve and go after them.

B43548

A, Mallard ducks swimming in an Oklahoma stream. (Biological Survey photo.)

B38359

B, Goldeneye duck and her brood out for a swim. (Biological Survey photo.)

Value of conserving wild ducks shown by United States Biological Survey exhibit at the North American Wildlife Conference.

WILDLIFE DISEASE AND POPULATION CYCLES RESEARCH

THURSDAY MORNING, FEBRUARY 6, 1936

Chairman: Dr. J. E. SHILLINGER, United States Bureau of Biological Survey.
Committee: E. C. O'ROKE, University of Michigan, Ann Arbor, Mich.; R. E. DELURY, Assistant Director, Royal Dominion Observatory, Ottawa, Canada.

PROGRESS REPORT OF WILDLIFE DISEASE STUDIES FOR 1935

(By Dr. R. G. GREEN, University of Minnesota, and Dr. J. E. SHILLINGER, U. S. Bureau of Biological Survey)

The cooperative disease investigation of the University of Minnesota, the Bureau of Biological Survey, and the Minnesota Department of Conservation has continued both field and laboratory investigation during the past year on a wide variety of animal species. Intensive efforts have been expended upon fur-bearing animals, including rabbits, and some work has been done on most of the other important species.

Continuance of the Lake Alexander area studies has yielded further information on the nature of the cycle of the snowshoe rabbit. It is obvious now that peak population of the snowshoe hare was reached in 1933, when the spring census based on banding and retrapping operations gave a population figure of 478 hares per square mile. The beginning decline was reported here a year ago, when figures of the 1934 spring census were cited giving a population of 374 per square mile. The census of 1935, taken at a corresponding time, is subject to further corrective calculation but closely approximated 220 hares per square mile, a figure representing a sharp decline from the previous year. The trapping and banding of hares in this area during the present winter suggest that a further drop of considerable magnitude will be found in the coming spring census.

During the past year snowshoe hares in Minnesota in general have declined noticeably and in some sections have become scarce. Our population determinations definitely show the start of the die-off in Minnesota 2 years previous to general observation.

Because of the widespread knowledge of tularemia as a "rabbit disease", we have carefully investigated the occurrence of this infection in relation to the disappearance of the snowshoe rabbits. Our results thus far indicate that tularemia is not the major factor in the die-off of the snowshoe hare. This is quite an opposite situation from that which we described for the cottontail rabbit in the same area. This animal, previous to the onset of the snowshoe die-off, suffered a high mortality which greatly limited its numbers, and we determined that the cause of mortality was tularemia. Not only was an appreciable number of cottontails infected but the degree of tick infection in the area rose rapidly at that time. As the snowshoe

rabbits have subsequently declined, we have not seen an appreciable increase in the number of hares infected with tularemia nor has there been an abnormally high degree of infection in the ticks found on hares. Final word cannot yet be given, as we have recently found a new pulmonary type of tularemia in snowshoes that must be appraised. However, our tentative conclusion is that tularemia in the snowshoe rabbit is a relatively mild disease and is not primarily responsible for the periodic decline.

Up to the present time little infectious disease other than tularemia has been discovered among snowshoe hares. Recently we have found in certain localities a prevalence of pulmonary disease. The nature of this lung infection has not been sufficiently worked out, but it appears that other diseases in addition to tularemia are concerned in the condition.

During 1935 the rabbit tick infestation of hares still remained high on the Lake Alexander area. The maximum tick infestation was reached in 1933 at the peak of the rabbit cycle, when the high average for the year was 4,911 per hare. The high average dropped only slightly in 1934 to 4,110 and rose to 4,245 in 1935. These figures do not represent actual populations, but simply ticks per hare at the highest yearly point. The number of feeding ticks is the closest approach to a population figure possible in our data, and this can be obtained by multiplying the high average of ticks for the year by the number of hares. This gives a high figure of 2,350,000 feeding ticks on the area for the high point 1933. The number dropped to 1,500,000 for 1934, and for this past year can be approximated at 934,000. From these figures it is seen that ticks are dying off very rapidly in the area, but that a concentration of ticks on the small rabbit population remaining keeps the number per rabbit very high.

We have found a small degree of infection of the ticks with tularemia each year. As soon as the rabbit tick emerges in the spring, tularemia can be found consistently in a small percentage, usually less than 0.1 percent. As a rule, the infection is not demonstrable during the hot summer months, but appears again in early fall. The highest rabbit tick infection with tularemia found in these studies appeared in early spring after the cottontail rabbits had died of this disease the preceding fall. The common occurrence of tularemia in ticks is not a condition peculiar to the North Central States. Isolations of the organism of this disease from ticks has been made with comparable ease in supplementary investigations in northern Manitoba and in central Alabama, areas picked at random for comparative study.

Although the investigation of grouse diseases has been reduced through partial discontinuance of funds, two new infectious diseases of ruffed grouse were recognized in the course of our work during the past year. *Pasteurella aviseptica*, the cause of fowl cholera in chickens, has been definitely indentified as producing natural disease in grouse. If this organism is as destructive in grouse as it is in domestic fowl, it may well be an important factor in grouse mortality. The second infection observed in grouse dying in the wild shows some characteristics of a filterable virus disease. Studies are not yet sufficiently advanced to give a satisfactory description of this infection.

Regional losses of gray foxes in Minnesota, described in earlier reports, occurred to a less extent than in the previous 2 years. In some areas of the State gray foxes are still abundant. As far as our investigations have progressed, the evidence is that the losses are due largely to an unknown filterable virus infection, which rather consistently produces degeneration of the adrenal glands. This disease has, at the same time, been present on silver-fox farms, but only moderate losses have been incurred.

During the period of wildlife decline there have been excessive losses on silver-fox farms in the North Central States. The unusual magnitude of the losses appears to be due to violent epizootics in the larger ranches rather than to more general occurrence of disease. If losses in pen-raised stock are at all related to the general decimation of wildlife species, it must be on a disease basis, as the ranch mortalities are definitely caused by disease. Most of the fox mortalities during this period are ascribable to the distemper virus of Laidlaw and Dunkin. A significant proportion are due to the fox encephalitis virus described by us and to the disease which we have found also in gray foxes, as outlined above.

Racoons have been found to be infected naturally with pseudotuberculosis. The causative organism, *Pasteurella pseudotuberculosis*, we have previously isolated from muskrats and beaver. Although this disease has been described in rabbits in Europe, we have not found it in rabbits in America, even though it has been looked for specifically.

It is now evident that rabbit "horns", previously regarded as freak growths, represent in reality an infectious disease, producing a considerable mortality in cottontail rabbits. Others have shown, as we have independently, that the horns are infectious, warty growths caused by a filterable virus. Recently we have demonstrated that the virus of rabbit horns can be transmitted by the bite of a tick. It is indicated that the virus may also be transmitted by the bite of mosquitoes or biting flies. Under experimental conditions the horns grow to enormous size. It is probable that in nature they often grow to a size incompatible with an active life. The horns bleed profusely upon slight injury. As others have demonstrated, and as we also have observed, the horns often develop a cancerous growth, which results fatally.

Tuberculosis has recently been found involving an entire pheasant farm devoted to the raising of black pheasants. While the mortality in the outbreak was principally in male birds, examination of females showed them to be heavily infected with this disease. Canada geese held in an enclosure for decoys were found infected with tuberculosis. Although only one of seven died, the causative organism was demonstrated in the upper respiratory tracts of all birds in the flock.

Discovery of the Organism of Ulcerative Enteritis

(By L. C. Morley and P. W. Wetmore, Disease Control, United States Bureau of Biological Survey)

The occurrence of ulcerative enteritis, or quail disease, in upland game birds was first brought to the attention of sportsmen early in 1900. The importation of Mexican quail at that time was attended by heavy losses from this highly infectious and rapidly fatal disease.

The growing demand for propagated birds for restocking purposes has resulted in an increased number of game farms. The concentration of many birds on limited areas creates favorable conditions for the transmission of the infection, and the devastating results following the sudden onset of an enzootic of ulcerative enteritis under such conditions are well known to the majority of game breeders. The bobwhite, the valley quail, Gambel's quail, the mountain quail, the sharp-tailed grouse, and the ruffed grouse, are all found to be susceptible.

In addition to the economic importance of this disease to game breeders, the observations on ulcerative enteritis in wild ruffed grouse, and the suggested prevalence of this infection in the game birds throughout the United States make it a matter of grave concern to naturalists and sportsmen.

A number of investigators in the past have reported on the disease in quail, but no conclusive evidence has been advanced to incriminate any organism as the causative agent. Since natural infection is contracted from the ingestion of infective material, it is apparent that the feeding test must be the criterion in attempting to incriminate any organism as the causative agent. Morse, in publishing the results of his studies of "quail disease", considered the causative agent an organism of the colon group. He regarded this as a variant of the organism *Bacillus scoticus migula*, which was described by Klein as the etiological agent of grouse disease. Morse found that his organism was pathogenic for birds when injected, but that it gave no results when fed. Pickens, De Volt, and Shillinger isolated an organism from diseased birds that was pathogenic for quail and guinea pigs when injected subcutaneously, but it produced no symptoms of disease when given by mouth. The work of other investigators who have published on the same subject has shown similar or consistently negative results.

The results of our work have shown conclusively that ulcerative enteritis is of bacterial origin. In the early part of our investigation an organism isolated in pure culture from the liver of a diseased quail produced death with typical lesions of the disease, in 12 out of 15 birds. This organism retained its virulence during seven successive transfers. These results have been successfully repeated a number of times under carefully controlled conditions, with the exception that the majority of the strains soon lost their virulence.

The cultural characteristics of this organism from quail are typical of the genus *Corynebacterium* but are not identical with any of the previously described species. Since the birds most commonly affected are members of the family Perdicidae, we have tentatively named the organism *Corynebacterium perdicium*. It is a Gram-positive, nonmotile, aerobic, pleomorphicrod. Morphologically it may be compared with the bacterium causing diptheria in human beings.

The bacteria are found in the liver, spleen, and intestines of the deceased birds, and their presence can usually be demonstrated in a fresh tissue smear of the organs by a Grain stain. They occur in tissues as short rods in clumps and predominantly take the counter stain. This appears to be a characteristic that is readily recognized,

and a preliminary diagnosis can be easily substantiated by transmission tests.

In early transfer cultures, reproduction is in small clusters. Old cultures may appear as coccoid forms, beaded rods, or slender, slightly curved rods, and often branching filaments.

The organisms causing ulcerative enteritis cannot be induced to grow on plated or slanted solid media when first recovered from the tissues of the bird. At best it grows poorly, but our best growth has been obtained with liquid or semisolid media. Little apparent reproduction can be noted under 48 to 72 hours. The slow growth and the inability of this organism to reproduce on solid media apparently explain the failures of the previous investigators who have worked on this problem.

The work thus far since the discovery of the causative organism has been confined principally to a study of the cultural characteristics. A shortage in the supply of propagated quail for experimental work has limited the attempts to work out a practical application for our findings. It is hoped that a prophylactic or curative treatment may be developed from the basic research thus far accomplished. This hope is strengthened by recent findings, but the work has not progressed to the point that any definite statement can yet be made.

Discussion

Dr. Green. Isolation of any organism which may be the cause of a disease is frequently an extremely difficult procedure before the right organism is found. A number of organisms have been thought to be associated with this disease. I have seen some of the technical detail and I am sure that the work done on the other organisms does not compare with the research done in isolating the one finally incriminated. I feel sure that the kinds of experiments made by Dr. Morley and Mrs. Wetmore have proved that this organism is the cause of this disease.

Question. How is this disease transmitted to birds?

Dr. Morley. We did not go into the details of this matter. The infective material is passed through the intestinal tract. Infection is believed to take place by birds ingesting contaminated food soiled by infected subjects.

The Lungworm Situation in the White-tailed Deer (Odocoileus Virginianus Borealis) in Michigan

(By Earl C. O'Roke, University of Michigan, Ann Arbor, Mich.)

INTRODUCTION

It is not my purpose to give an extended discussion of the history of scientific progress regarding lungworms in cattle, sheep, and goats, and related wild ruminants. Neither do I propose to enter into much detail regarding description of species. These things, of course, have their place in scientific papers and it is necessary for the parasitologist to understand them, if he would continue to make progress in this field of investigation. We shall, therefore, proceed directly to the point and I will tell you about the studies that we have

been carrying on in Michigan under the auspices of the school of forestry and conservation which, as you know, is a unit of the University of Michigan.

Casual observations were begun as early as 1929 when I first went into the field with Mr. V. H. Cahalane, now of theWildlife Division of the United States National Parks Service, who at that time was in the employ of the game division of the Michigan Department of Conservation. In 1932, we found what appeared to be a case of verminous pneumonia in a wild deer found dead in the vicinity of Alpena, Mich., but did not discover any lungworms. In the meantime, larval lungworms were found in abundance by Dr. Don R. Coburn, in deer from the Alpena area.

It was not until the winter of 1933–34, however, that our studies began in earnest. At that time a deer census on the university owned Edwin S. George Reserve, 25 miles from Ann Arbor disclosed the fact that the animals were becoming too numerous. Steps were, therefore, taken to reduce the herd. Dr. Adolph Murie, now of the Wildlife Division of the United States National Park Service, was at that time in the employ of the Museum of Zoology and was living on the reserve. He brought in the first adult lungworms from a deer (7 months' old fawn) shot on the reserve January 25, 1934.

Several autopsies were made during the remainder of the winter, and next spring a definite research project was set up for the study of lungworms on the area and elsewhere in Michigan. The project has been financed largely through faculty research grants. To date 133 autopsies have been performed on deer from the George Reserve and elsewhere in Michigan. The following species of lungworms have been found: *Dictyocaulus viviparous*, the cattle lungworm; *Dictyocaulus filaria*, the sheep lungworm; *Protostrongylus corburni; Pneumostrongylus.*

Both adults and larvae of the first three species have been found. Regarding *Pneumostrongylus*, our records are open to question, as the diagnosis was made on the basis of lesions and larvae only and we found no adult worms to verify the other findings.

In no case did we find adult worms of the genus *Dictyocaulus* in large numbers. Five specimens was the most yielded by any one deer. The adults of this genus are found in the lower trachea, bronchial tubes, and other air passages of the lungs. These small numbers are in sharp contrast to the situation in sheep, where one may find large masses of the worms practically occluding some of the air passages. This may indicate that deer are normally resistant to sheep and cattle lungworms. Since *Dictyocaulus* gives birth to living young, it was not difficult to distinguish the genus when adult females were found. *Protostrongylus*, on the other hand, instead of living free in the air passages, threads through the lung tissues and deposits eggs instead of giving birth to living young. These eggs were found in all stages of development, before the adults were discovered. From numerous observations made on frozen sections of fresh lung material, it would appear that the adult females of this species in the last stage of their development consist of very little but a gravid uterus and that this disintegrates leaving the eggs scattered through the lung tissue. The larvae of this species

may be found in enormous numbers in the lung tissue. From thick, frozen sections of a measured amount of lung it was computed that as many as 6,000 larvae may be present in 1 cubic centimeter of material. This represents an extreme case, however, and the numbers of larvae vary considerably. In fact, it is sometimes necessary to examine section after section, or numerous scrapings from the lower air passages, before a single larva can be found.

Regarding distribution throughout the year, larval lungworms have been found at all months. The records for the adults are not so complete. All age classes of deer, from fawns over 3 months old to aged animals, appear to be susceptible. Two classes of animals are apparently more susceptible to infection than others. These are young animals, namely, fawns and yearlings, and aged animals, although our records for the last class are too few to be of much significance.

As to the roles of immunity and resistance, we have no data that can be interpreted with any degree of finality. My theory, based upon field evidence, is that young animals are very susceptible and that this is true also for aged animals that are not in the best of condition. Medium-aged animals in good condition—by that I mean healthy breeding adults—are apparently more resistant. I cannot, as a parasitologist, conceive of adult lungworms living year after year in the body of a deer and continuously giving rise to larvae, so it would appear that reinfection is the rule rather than the exception.

I have had a small herd of three captive deer under observation since August 1934. These animals were all over 7 years old and were shipped to Ann Arbor from Ontario, Canada, 7 years ago. Fecal samples collected from these deer have been examined from time to time. Two of these animals had lungworms throughout the autumn of 1934. One of them, an old buck in unthrifty condition, died from lungworm pneumonia February 24, 1935. The other infected animal apparently lost its infection in April 1935, and, so far as I know, there has been no recurrence. These animals have had no contact with sheep and cattle during the period of their captivity. The genus of lungworm found was apparently *Protostrongylus*.

LIFE HISTORY STUDIES

Two types of life histories of lungworms are known, the direct and indirect. The genus *Dictyocaulus* has a direct life cycle, no intermediate host being involved. The larvae pass from the trachea up to the glottis, down the esophagus, and out through the digestive tract with the feces. After certain ecdyses, they again enter the digestive tract of deer through food or drink and reach the lungs, where they come to maturity, mate, and produce larvae.

The other type of life cycle is an indirect one, an intermediate host, such as a snail or earthworm, being involved.

Mixed infections of *Dictyocaulus* and *Protostrongylus* have complicated the present investigations. In 1934 we captured six fawns shortly after birth and in 1935 three. All of these nine fawns were raised successfully on bottles and were kept as controls until such time as they were used in experiments. The only precautions taken in maintaining the controls were to rear the animals on ground not

contaminated by deer, sheep, cattle, or other livestock nor to give them food that had had any chance to become contaminated. No infections have ever occurred in any of these fawns while they were being kept as controls.

As regards experimental transmission, we have used all but two of the fawns in experiments of various kinds, trying to prove or disprove the direct transmission of *Protostrongylus*. With one exception, the experiments have failed. We did not get infection by direct means of administering infective larvae with food or drink.

In the one experimental transmission that was successful, we don't know how the transmission was effected. On August 18, 1934, two 2 months' old fawns were liberated in a pen with two infected adult deer. This enclosure consisted of a pasture, or fenced deer paddock, of about 3 acres, through which a small stream was flowing. On February 18, 1935, one of these fawns, as determined by fecal examination, was found to be infected. Larvae continued to show in the feces until April 22, after which time they could no longer be recovered, and there has been no recurrence of the infection. It is possible, of course, that the infection was actually present in the fawn prior to February 18 but that examinations before this time failed to reveal any parasites.

For those not familiar with the technique of examining deer feces for larval lungworms, I may say that one of the simplest and most effective methods is to place a few fresh pellets, not more than 10, in a Syracuse watch glass. Do not macerate the pellets but cover with water and set aside in the laboratory at room temperature. The larvae begin to emerge in less than an hour, and in from 3 to 24 hours practically all will have emerged. The pellets can then be transferred with forceps and the water which remains in the dishes examined rapidly by means of a binocular microscope. If one wishes to do more elaborate work, some type of Baerman apparatus may be used.

LONGEVITY OF LARVAE

Even though we haven't succeeded in finding out what we wanted to know regarding transmission, under natural field conditions we have cleared the way for future experimentation involving laboratory animals and intermediate hosts and have learned a great deal about the longevity and behavior of the larvae in nature. These findings may be summarized briefly: In animals that have died during the winter and remain frozen until the spring thaw, the larvae remain alive in the lungs and become active when the material is thawed out in the laboratory. Larvae can also withstand repeated thawing and freezing. This has been checked in two ways, by keeping infected lungs out of doors under variable conditions of winter temperatures and by keeping lung material in the evaporator pan of an electric refrigerator, removing it from time to time for examination, then refreezing the material. Material has been kept out of doors for 5 weeks under the above conditions and in the refrigerator for 7 weeks. We have considerable data on the percentage survival of larvae under refrigerator conditions, but this will not be discussed in this paper.

Living larvae cannot withstand much fermentation or putrefaction of material containing them. They die as soon as lung material containing them putrefies. In fecal cultures, when the temperature is

high enough to produce much fermentation or excessive growth of molds, the larvae soon die.

Larvae are highly resistant to desiccation. They do not encyst, but become inactive in any position that they happen to be in when the material dries down sufficiently to prevent swimming operations or crawling movements through a surface film of water. Complete drying in an oven at temperatures between room temperature and body temperature kills them. They can be dried down in debris in the bottom of Syracuse watch glasses, however, and the glasses stacked in the laboratory for several days without killing the larvae.

The set of lantern slides which I will show you at this time are all photomicrographs of the same worm, which was dried down and resuscitated several times in succession. You will note that a worm in drying down loses considerable of its moisture and becomes smaller than it is when active.

The maximum length of time that I have kept larvae alive in fecal cultures at room temperatures was 27 days. They apparently can remain alive for several weeks after reaching the infective stage.

PATHOGENICITY

As has been mentioned before, this study is essentially a field study, and the observations that have been made regarding the pathogenicity of deer lungworms under average field conditions are believed to give a true picture of the situation. It would appear that infection in the deer herds of Michigan are very general and that the percentage of infected animals runs from 20 percent to 100 percent. These conclusions are drawn from the autopsies previously mentioned and from the study of numerous fecal samples. There is evidence from the studies on the George Reserve that the heaviest infections and the highest percentage of infection are associated with a heavy population and a concentration of this heavy population around limited water holes in a dry season (1934). In 1935 a reduced population and a more abundant and uniform distribution of watering places apparently accounted for the lowered percentage of infection.

Nominal infections in otherwise healthy deer do not appear to produce discernible pathological effects.

There is a correlation between heavy lungworm infections in fawns and winter losses of fawns in certain areas in Michigan. It is my belief, however, that these losses may be largely due to malnutrition. I would not wish to go on record as assigning these losses to lungworms until I had had a chance to check the observations experimentally by trapping infected fawns and feeding them properly to see whether the losses could be averted. My work on the George Reserve has made me cautious in this respect, for we have shot fawns there apparently as heavily infected as some of those found dead in the Alpena area, and the George Reserve fawns were well fed and in good condition.

Regarding old, unthrifty animals and lungworm pneumonia, I have one record of a captive animal that died of lungworm pneumonia February 24, 1934. This, together with autopsy records of old animals shot on the George Reserve, leads me to believe that

in this class of animals lungworms may well be, indirectly, at least, the cause of death.

For the purposes of this paper we need not go deeply into the tissue changes produced by the presence of lungworms. Large numbers of larvae cause excessive mucous production in the lower air passages. Scar tissue and a tendency to the production of fibrous changes is common. Adult lungworms cause the formation of scar tissue especially on or near the surface of the lungs. Occasionally adult worms or portions of worms in the lower air passages are walled off by calcareous cysts. Pus may also be present.

In spite of these things it would appear that the tremendous vitality of deer enables them to recover remarkably from lungworm attacks.

While these investigations are still unfinished, particularly as regards the life history of the species of *Protostrongylus* found in the white-tailed deer in Michigan, the work thus far is significant in that it is believed to give a rather complete picture of the lungworm situation at present and to suggest management procedure which, if followed, should tend to prevent the situation's becoming more serious in the future. Regardless of what the life history of *Protostrongylus* may be found to be, deer should be so managed that there is a proper distribution of watering places in the summertime and sufficient food in the wintertime.

Foremost in the picture is the proper management through regulated hunting, perhaps, of the deer herds in such manner that overpopulations will not occur. This may well involve doe shooting where necessary and the selective elimination of aged unthrifty animals of either sex. You may well ask what is a normal deer population and what is the carrying capacity of deer range. I am sure that these questions cannot be answered arbitrarily. Studies of populations and stocking should go hand in hand with studies of disease and parasitism.

In closing, may I summarize briefly the results of the study.

1. It has been a field study to determine the extent and seriousness of parasitism by deer lungworms in the white-tailed deer in Michigan.

2. Autopsies have been made in all months of the year as well as in the legal hunting season.

3. Fecal samples have been examined from numerous areas and the larval lungworms found compared with those disclosed by the autopsies.

4. Nine captive fawns have been reared, first as controls and later used in experiments. The controls were maintained 100 percent free from lungworms.

5. Experiments seeking to effect direct transmission of *Protostrongylus* Coburni failed.

6. There was one case of successful transmission under natural field conditions, but it is not known whether this was direct or whether an intermediate host was involved.

7. The pathological effects of lungworms on deer are described briefly.

8. A management program is suggested which if followed should tend to reduce the dangers of lungworm infections in deer.

DISCUSSION

NICHOLAS BIDDLE (president, Pennsylvania Board Game Commission). Mr. King, in this grouse cycle, would the fact that the open seasons on grouse be regulated according to the cycle that is increased at top of cycle or decreased at the low point?

Mr. KING. Not if there is anything in my hypothesis.

Mr. BIDDLE. Wouldn't it go lower if you have fewer birds and they were to lay fewer eggs?

Mr. KING. Shooting is one of the causes of loss of birds in younger age classes. Loss through hunting is serious.

Dr. GREEN. It seems to me that, from the hypothesis as presented, you cut down your grouse population during the decline by continued shooting during this period.

Mr. KING. Do not take any chances of decreasing your older birds.

Mr. BIDDLE. Should we not close our season during the decline of the season?

Mr. KING. Yes.

Dr. SHILLINGER. In following this discussion on closing the hunting reason as the decline is in progress, would it not be preferable to enlarge the bag limit when they are on the increase? On Lake Alexander, in which district we have conducted wildlife experiments in Minnesota, areas close to our field laboratory have been used for taking samples for detailed laboratory study. Outside of the area few, if any, animals were taken. This past season we wanted the local hunters to collect some samples outside of the area where most of the shooting had been done and the populations were very low, giving evidence that a severe die-off had occurred and practically wiped out the population, where it had unrestricted possibilities for increase to overabundance. In the area where the population had been kept from an extreme peak, hunters were still able to collect specimens. Others of our Bureau were able to present similar illustrations. On one side of the river rodent control had been carried out. On the other side no particular organized rodent control had been in practice. There was a regular increase of rabbits on the side where control was practiced. On the other side the population of jackrabbits was at times very insignificant. This would at least furnish some evidence that limiting the hunting season when the population is on the rise and closing it when it is on the decline would be in order.

Mr. RAYBURN (Louisiana). I have noticed the same thing in regard to muskrats. Would the hypothesis affect them?

Mr. KING. I feel very inadequate to discuss Louisiana conditions.

In reply to Dr. Shillinger, I cannot, of course, do more than agree with what he said. I did not know about the experiments on the Lake Alexander area. However, if my lecture has served no other purpose than to bring to light some of the facts discussed, I feel that it has been worth while.

Mr. EDMINISTER (New York). I would like to bring out three major points. Conditions in New York do not agree with the hypothesis as set forth by Mr. King. The average number of eggs laid, based on a cycle range from 11 and 12 years, seems to furnish no indication of a change of trend in the ability of the bird to lay or in the fertility of those eggs. Cycles do not run similar. Individual coverts reach their peaks. As an illustration, one particular covert reached its peak of

population when the general cycle was at its low. Population-control measures as a possibility for offsetting the cycle and for controlling the cycle on several thousand acres of land in New York have been studied with respect to the number of broods per acre and the number of birds surviving per brood.

Dr. MORLEY. Mr. King, considering the chart that we have here, how do the number of eggs and the number of young correspond to the next rise in the sun spot?

Mr. KING. There would appear to be an increase based on the fact that we got an increase in 1935 over 1934. However, that is a period of 1 year and insufficient to base any conclusions. I wouldn't go so far as to say that would be repeated every time. I would expect this—during the next 3-year period, it will approach again the high figure.

Dr. MORLEY. If there is a shortage of some necessary element for reproduction, how might that affect the number of eggs laid and is it affected immediately?

Mr. KING. That could not have been very great in 1935. An apparent increase was seen in 1935. The factor to consider is, however, the great majority of birds during that period have died. Therefore it would require a larger clutch of eggs.

Mr. H. L. STODDARD. It may be only coincidence that our most common rodent has disappeared almost entirely. I would recommend extensive study of southern rodents for some time.

Dr. SHILLINGER. Do not some of Mr. King's observations run up against some natural barrier? This disappearance seems to be more directly due to some local physical environment. In some of the die-offs in cotton rats in the South as well as rabbits in the north a river or lake may be the boundary.

Mr. KING. Two sides of a river may have different conditions. However, you may reach a high in Massachusetts and South Carolina at the same time.

Mr. HARKNESS. I would like to ask Mr. King what causes the very high mortality in the very young.

Mr. KING. I can't account for the 75-percent mortality. In our region at least a large part of this loss is due to uneven terrain. A large part of our losses are due to extremely poor food conditions under which the female has to produce a relatively large clutch of eggs.

Mr. HARKNESS. Do you refer to the food of the mother before laying the egg?

Mr. KING. I refer principally to the food of the mother before laying the egg.

Mr. HARKNESS. Some of the young start with a handicap.

Mr. KING. I am optimistic about reproduction with reference to the clutch. I believe that we can keep the red line [referring to the chart] from dropping so far down through our control of the food supply to the female grouse during March and April. We are going to find the truth of it.

Mr. HAMILTON. It is pretty well established that the meadow mouse is in the 4-year cycle. Middelton has done some work and he has fairly well established a 4-year cycle for them. The top of that peak is very smooth and does not coincide with the 11-year cycle. Do more explaining about the 11-year cycle.

Mr. King. All I can say with connection to that 4-year cycle is that it seems to me at present possibly it can be explained that all animals, as far as I know, are governed by a 4-year-cycle period. The meadow mice are very rapid breeders and have large litters of young. We build up a population level with rapid-breeding animals that limits itself with their special environment in which they live. They may drop off, they may respond to it by migration and take the result due to migration rather than conditions of the environment. In the hypothesis we have built up to a certain point because of the same factors that are operating here. Here through migration they respond irregularly and the death rate maintains a plateau. I don't know of any 4-year cycle in which the increase occurred and is followed by another increase and reaches its peak in 4 years.

Mr. Hamilton. How about microbes?

Mr. King. We have not tried to put together such things and set up a hypothesis taking those into account. I do want to emphasize the fact that this really is a hypothesis and not facts.

Mr. Nichols (Arizona). The botanists are having the same thing in regard to the lag. Dr. Douglas has conducted some marvelous experiments. They are finding the same results in this regard. The cycle runs from 1 or 2 years' lag among the plants. I cannot explain further.

Dr. Brown. From the physical, chemical viewpoint we know that species are chemically different and positions in development are physically different. It has been my opportunity to make a study in comparative embryology. It is based on 65 percent black skimmer embryos. In working out a case study according to our set measurements and graphing those results from the number we had in the collection and dividing these embryos up, there is a definite rhythm across the chart and that rhythm is in relation to physical and chemical. We certainly have here a definite rhythm in development before the bird is hatched till we have rhythm within rhythm. I think that the sunspot theory can be applied and carefully worked out with the different species. It will take time to develop. The sun undoubtedly has a great effect upon the food supply of plants and animals. We must all do case work for the facts and in time we will get something valuable worked up.

Dr. Shillinger. I would like to make one suggestion as to the extent of the losses as are associated with precipitation. In regard to the muskrat rise and decline in Louisiana I have observed in my personal studies extensive drops in muskrat population during dry times. In dry runways and paths and in dry seasons muskrats suffer a loss due to coccidosis and worm infestations. I do think that these immediate local physical conditions should be taken into consideration when we are considering cycles or rises and falls of population.

Fluctuations in the Population of Bobwhite Quail in the South

(By Dr. I. N. Kennedy, executive secretary, department of game and fresh-water fish, Florida)

The question assigned for discussion, "Fluctuations in the population of bobwhite quail in the South", carries on far into contro-

versial territory. If my entrance into the field might be adjudged evidence of "rushing in where angels fear to tread", let me say, I find courage to attempt it in the fact that I walk not alone. Recognizing the limitations of my own observations (based on many years of interest from a sportsman's viewpoint, supplemented by 6 years as an officer in Florida's conservation field), request was made of the chief conservation officer of each Southern State for information bearing on the subject as each knew it in his respective State. Request for such information was further made to that eminent authority on bobwhite quail, Herbert L. Stoddard, who, since March 17, 1924, has devoted his time to the study of these questions, and to the promotion of programs for the increase of the quail population in areas under his direction. Since much of Mr. Stoddard's work has been carried on in the Tallahassee-Thomasville section, over a tract of some 200,000 acres lying between these two cities, what he has to say is of particular significance from the Florida-Georgia viewpoint.

The paper that follows is a compendium of information from the various sources referred to. Not all who contributed are directly quoted. It presents the concensus of opinion, and appreciation is hereby expressed to all cooperating.

In presenting the paper the following questions are discussed, and in the order suggested:

1. Does the fluctuation of bobwhite quail in the South occur in recognizable cycles?
2. How is supply affected by climatic conditions?
3. What bearing, if any, has the sportsman's bag on fluctuations?
4. Have changes in agricultural practices affected supply?
5. What bearing has game management upon supply?

Turning to question 1, "Does the fluctuation in bobwhite quail in the South occur in recognizable cycles?" I quote you Chief Game Warden E. Lee LeCompte, of Maryland, who says: "The population of bobwhite does not fluctuate much except where there is a reason." In other words, nothing has established the fact that fluctuation is of periodic occurrence. Mr. LeCompte has spoken for many, among them Florida. Supporting this is the statement from Stoddard: "While there may be slight cyclical fluctuations, we have been unable to settle the matter one way or another with the figures we have gathered."

We turn from this to question 2, "How is supply affected by climatic conditions?" The remainder of the reply from Maryland deals directly with the affect of cold and rainstorms. Reverting to August 1933, Mr. LeCompte wrote that during that month "Maryland was visited by the worst northeast rainstorm experienced in years, with a 5-day continual downpour, and the Chesapeake Bay country was flooded, the worst it has been since the centennial flood. This was followed by the winter of 1934, which the Weather Bureau claims was the coldest on record in 50 years. Bitter cold weather over a 7-week period with heavy snows. This was followed by a very wet summer in 1934, with another extremely bitter cold winter of 1935, with heavy snows lasting into March. We were again visited by a 4-day rainstorm the first week in September 1935." This sequence of unfavorable weather, Mr. LeCompte states: "Were very detrimental to our ground-nesting birds and small game animals." Then

follows the statement that fluctuations in the population of bobwhite have decreased following the planting of from 6,000 to 8,000 and, in 1933, 11,000 birds for propagation purposes.

From Virginia, in a letter from C. O. Handley, associate conservationist, we have a report on the result of drought and cold as observed in that State. Referring first to reports of unusual lows in the quail supply in Virginia in 1900 (or possibly 2 years earlier), in 1918 and again in 1930, with lesser lows between these dates, Mr. Handley says:

The basic reason for these sudden fluctuations in the quail population can in each instance be traced to the elements. Severe winters, such as those of 1899–1900 and 1917–18, when deep snows accompanied by low temperatures prevailed for an unusually long period for this region, have resulted in the most serious losses known to us. To the great drought of the summer of 1930, which continued on through the summer of 1931 over the central portion of the State, is attributed the shortages recorded for the hunting seasons of 1930–31 and 1931–32. Excessively wet breeding seasons are also known to be responsible for heavy losses in the number of quail, though I can cite no example other than for restricted localities, where wet breeding seasons have resulted in losses comparable to those noted for either severe winter weather or drought.

Mr. Handley follows this statement by saying:

Following the drought of 1930 and 1931 quail have increased steadily and were more abundant this last fall than in the fall of 1929, the last previous high. To the unobserving the recovery from the 2 bad years of drought may seem remarkable. This may be readily attributable to the fact that the supply of breeding birds left at the end of the period of drought (spring of 1932) was considerably greater than that left at the close of the winter of 1917–18. * * * It may be interesting to note that the amount of brood stock available at the end of the period of drought can be attributed largely to two facts, first, to less hunting; second, to the birds being mostly in the woods and thick places where they were both hard to find and hard to kill. The drought, which cut down the number of quail, had restricted their foods and cover to water courses, lowlands, and wooded areas.

Following the line of thought suggested in Mr. Handley's letter, we turn to that of Commissioner J. D. Chalk, of the division of game and inland fisheries, North Carolina, who says:

The quail population of North Carolina has shown an increase during the past few years due, I believe, largely to the drought conditions, which put the birds into swamps and close cover. The birds may not have raised as bountifully during those years, but the birds were more inaccessible to the hunter, and the kill of birds during that time was much lighter. This year we have more normal conditions as to ground level of water, proper growth of natural foods and cover, and the hunter generally thinks there has been a decided increase in the number of quail raised, when, in reality, the birds have but gone back to their natural habits of feeding and using in the upland fields.

My observation has been that the fluctuation in our quail crop is controlled largely by the activities of the hunter. This year the hunter has been at a disadvantage in North Carolina, as we have had an unusual amount of bad weather during the open season, especially around the holidays. We had an 8-inch snow around Christmas time, the heaviest in a half century, and all during the holiday season and for a period of from 2 to 3 weeks. During the last of December and the first of January no hunting could be done, and inasmuch as this is the period of the open season when the greatest quantity of quail are usually killed, the storm was decidedly a conservation measure.

From Mr. Stoddard we have the following:

The greatest fluctuations in the numbers seem to be caused by cloudbursts or abnormally severe rainstorms at critical times during the breeding seasons, which lessen reproduction, as against higher total reproduction in seasons of

very favorable weather. This refers to the region south of the severe snows. Severe drought during the breeding season may be much more adverse to quail reproduction than overly heavy rainfall and cause fluctuations, especially in arid regions and on droughty soils.

Overshooting, pasturing of lands, summer fires, and all such unfavorable factors, of course, cause local fluctuations in quail populations. Under such factors as high water in lowland regions, birds may be forced out of the low ground onto the ridges where altogether too many may be shot, and cause a shortage for a year or more. On the other hand, dry swamps and low ground through several successive shooting seasons may cause a fine increase in population, due to the fact that the birds are unavailable to the shooters.

These comments by Mr. Stoddard are pertinent, bearing on the general subject as they do.

In speaking for Florida, which showed a drop in available quail in the drought years of 1933–34, with a seeming increase in the 1934–35 season (attributable, we believe, to the effect of drought years which drove the birds to better cover both during nesting and hunting seasons) we have during the 1935–36 season, which closes February 15, contrasting conditions over two large areas in the State. In the northwestern part of the State and extending halfway across the northern tier of counties, we have an unusual abundance of bobwhite quail. East of the Tallahassee section and down the central part of the State, the commission has an urgent demand from sportsmen and conservation officers of the area for the budgeting of funds with which to restock depleted areas, and at its meeting held on January 20 budgeted the first considerable sum ever appropriated in Florida for this purpose.

These contrasting conditions in the two sections have developed under approximately uniform weather conditions. There have been no ravages of disease or increase in predators to which such a widespread loss of birds from the area might be attributed. Overshooting seems to be the underlying cause.

This thought carries us to the third point suggested in the development of the paper—"What bearing has the sportsman's bag and the duration of the hunting season on the fluctuation in supply?" In suggesting this we will refer not to legal bag limits fixed by States but rather to the total number of birds taken in relation to population. With the absolute need for maintaining breeding stock in sufficient quantity in all quail territory, it is needless to discuss this. The replies from States which, almost without exception, referred to the increase noted where seemingly adverse weather conditions afforded protection from overshooting furnishes food for thought. Certainly it points to a very direct relationship between the numbers of birds taken from a territory and the fluctuation in quail population. In view of the fact that there are yet too many who disregard legal bag limits, the length of the hunting season, and the type of gun used in taking birds has a very direct bearing on fluctuation in supply or the loss of quail shooting in a given territory.

Passing to the fourth topic suggested—"Have developments and changes in agricultural practices affected supply?" We quote you again from the letter received from Mr. Handley, of Virginia:

While I am convinced that the elements are largely responsible for marked fluctuations in the quail population of the State as a whole, it should not be overlooked that there are other factors of importance which exert some influence. Gradual changes in environments, such as the wholesale abandonment

251851

A, Planting 90,000 trout in a lake in Deschutes National Forest, Oreg. (Forest Service photo.)

152470

B Planting fish fry in a stream near Cache National Forest, Utah. (Forest Service photo.)

42172A

A, Woodchuck in Roosevelt National Forest, Colo. (Forest Service photo.)

209280

B, A 35-pound beaver. (Forest Service photo.)

of agricultural lands, which have grown up to pines and brush, and become less suitable for quail, and better fire protection in quail territory, have had a tendency to lower the saturation point for quail. On the other hand, the introduction of Korean lespedeza and lespedeza sericea, or sericea, as it is commonly called, is now becoming general enough to exert a tremendous influence toward the increase of quail. As time goes and these quail food plants become more and more generally sown throughout the State, I am convinced that the quail population will increase several times over what it is now. It should be kept in mind that the changes in environment, such as these, are gradual and the influences which they exert on the quail population are likewise gradual.

The expenditure in Virginia of $348,325 for the taking of 695,653 hawks, owls, and crows, over the 6-year period, 1924–29, may have saved some quail, but I am of the opinion that had the same amount of money been spent on lespedeza seed for distribution, more would have been accomplished. Furthermore, since the paying of bounties has been stopped, quail have continued to increase and are now more abundant than at any time when bounties were paid. Wise game laws enforced exert an important influence on the quail population.

We turn you now to an article written from North Carolina in 1933 for the Atlantic Sportsman, by Capt. W. T. Combs, referred to as an engineer, explorer, and naturalist, bearing directly on the effect of change in land usages.

Discussing the change from the cultivated farm to the pine forest as it bears upon the status of the bobwhite quail in the area, Captain Combs wrote:

1. There is about one covey of quail now to where there were five when I began shooting some 25 years ago.
2. There is about 1 now to where there were 10 in my father's day (50 to 60 years ago) when there were but few pines in this section of North Carolina.
3. There was at least 10 times the acreage of fields, food, and cover in my father's day as compared to the acreage of fields, food, and cover today.
4. There were 100 birds killed in my father's day to 1 killed today.
5. Then we have the following ratio of elapsed time to existing coveys of quail; 50 years, 25 years, 1 year; 10 coveys, 5 coveys, 1 covey.

This ratio has been substantiated by many old-timers with whom I have discussed the fading of our quail. Often I have heard my father say he remembered the first pine tree that was known to have taken root in Rockingham County in North Carolina. Then the pines came with a rush. They covered all land not cultivated. Then came the era of "clean farming", the kind of farming that called for clearing up every hedge row and ditch bank. The kind of farming that plowed up every field in the fall that was intended for cultivation in the spring * * * clean, extensive, intensive cultivation with a bang * * * and 1 covey will be found today over the same ground that produced 5 coveys 25 years ago, and 10 coveys 50 years ago.

While there has been no opportunity to check on this article, due to shortness of time, it bears so directly upon the question, and is so in keeping with the observations of many, it is offered.

In Florida we have the history of farms and plantations, some a few hundred acres in extent, some many thousands, well stocked with bobwhite quail as they developed a century ago, and bobwhite found in increasing numbers as fertile fields took the place of cleared forests and were planted to oats, rye, corn, and other feed crops. With the invention of the cotton gin came the first radical change in farming in Florida and the other Southern States, for the fleecy staple supplanted fields of grain, and, though there was still an abundance of birds, it was not due to the cultivation of cotton but rather in spite of it. Cotton fields furnish no good quail territory. Under unprofitable agriculture and changing conditions with respect to farm labor, there came next the abandonment of the farms to tenant care, and in many sections the marked reduction in food crops with increasing

acreage in cotton. In recent years, with the advent of the county agricultural agent there has come a speeding up of the "clean cultivation program." Today we face a change in land usage that presages we know not what for game.

Facing these facts, conservationists are turning with increasing interest to the possibilities of increasing the game supply, particularly with reference to bobwhite quail, through the improvement of environment, especially of that on the farm, bobwhites' favorite rendezvous.

Speaking for Florida, we see a brightening spot on the horizon in the increase during the past 5 years in the number of farms in the State, as shown by comparison of the 1930 and the 1935 census. Five years ago there were 58,968 farms in Florida. The 1935 census showed 72,857 farms, an increase of 23 percent. The increase in acreage has been from 5,026,617 acres to 6,048,406. Farm ownership has increased during the period to more than 62 percent. On the other hand, through the rehabilitation program, the Federal Government is reaching for vast areas for forests in Florida.

We have no figures from other States bearing upon farm ownership and operation, but, assuming that they are comparable with those of Florida, do they not point to a large opportunity open to forward-looking game conservationists in the possibility for demonstrating to farmers of the new day the value of game to the farm, and of allying farm leaders in a constructive program for game management on the farm whereby, without detriment to other farm interests, favorable environment for bobwhite quail shall be provided throughout the South? I leave the question with you, a constant challenge in this new day of farming and of changing usages for land areas that must be affirmatively answered in the South, bobwhites' true domain, if this premier bird is to exist in anything like the abundance of former years.

The Prevention of Lead Poisoning in Waterfowl by the Use of Disintegrable Lead Shot

(R. G. Green, Medical School, University of Minnesota, and R. L. Dowdell, School of Mines and Metallurgy, University of Minnesota, Minneapolis)

Lead shot eaten by ducks is retained in the gizzard with natural grit and is slowly ground away. It is the continuous passage of lead through the intestine that results in sufficient absorption of lead to produce the fatal poisoning now so commonly observed in waterfowl.

The accumulation of lead shot in natural waters is gradually increasing, and this deposition is, to a certain extent, permanent because the high stability of lead enables it to withstand corrosion. While significant losses from lead poisoning are already occurring, the real seriousness of this problem is principally its future probabilities. When lead has accumulated to an extent that it produces serious limitations on the number of ducks, the very magnitude of the problem may put it beyond practical solution. It appears that lead poisoning in ducks is a problem that must be anticipated and not be allowed to develop to critical proportions.

The problem of lead poisoning in waterfowl could, of course, be solved by using a nontoxic metal, such as copper or iron, for shot pellets. The densities of these metals are far below that of lead. The use of either copper or iron would so change ballistics and decrease shooting ranges that it is doubtful that shot made from these metals would be acceptable. It therefore appears that the problem must be solved by some modification in the use of lead.

There appear to be three methods by which lead poisoning in ducks might possibly be prevented: First, the development and use of a nonpoisonous lead compound or alloy in which the nontoxic feature is due to chemical nature or physical combination; second, a lead alloy which would have a highly corrosible surface, so that lead shot in the gizzard would be ground away so rapidly that sufficient absorption for poisoning would not occur; third, an alloy of lead which would disintegrate in natural waters and either be not available to feeding ducks or disintegrate rapidly in the gizzard, if eaten, and pass out so quickly that poisoning could not occur.

It may be doubtful that the first method described can be realized, as the lead must be in metallic form to have the desired weight. The second method has the inherent weakness that, as the surface of particles is ground off, the exposed new surface becomes smaller and the grinding and elimination process consequently slows down. It has seemed to us that the third method is the most logical point of attack, although further investigations might show that a high surface erosion may be developed to a satisfactory degree.

We have studied the mechanics of gizzard action in ducks by the use of lead powder and X-ray pictures, and have determined that the gizzard will usually completely eliminate finely divided lead in 2 or 3 days. Passage of finely divided lead through the intestine was found to be very rapid, the time required for lead to pass from the gizzard to the cloaca being only a few hours. Elimination of lead powder from the gizzard through the gastrointestinal tract was found not to be a continuous process but to be controlled, apparently, by gizzard activity. It appears that after a period of grinding the gizzard contracts, forcing ground material into the intestine. Sometimes the contractures are so great as to force all grit up into the proventriculus and even into the lower esophagus. Occasionally upon relaxation of the gizzard, some of the grit and lead shot passes out into the intestine.

We have found that a combination of lead with a small amount of magnesium produces an alloy which, within certain limits, will disintegrate in the presence of water. The rate of disintegration can be varied by the percentage of magnesium present. X-rays show that pieces of this alloy will disintegrate in the gizzard of ducks without causing the bird inconvenience, and that the alloy will begin passing from the gizzard as fine particles at once. Within 24 hours most of the alloy will have been eliminated, and usually all traces of lead will have disappeared from the duck within 3 days.

In the lantern slides shown with this paper is depicted the disintegration of magnesium-lead alloy in the gizzard of mallard ducks. These slides were prepared from X-rays taken after feeding pieces of alloy by the use of a tube. The first series shows a rapid disintegration of alloy no. 9, containing 96 percent lead and 4 percent

magnesium. This series illustrates the great rapidity with which an alloy of such composition disintegrates. The first picture reveals a large piece of alloy in the lower esophagus. In the second picture, taken 13 minutes later, the alloy is situated at the entrance of the proventriculus and is already considerably disintegrated. A fairly large fragment of alloy is clearly separated from the main mass and several small granules of lead are also free. The next picture, taken 58 minutes after feeding, exhibits the entire mass of lead alloy disintegrated into small granules scattered throughout the gizzard. Small grains of alloy are plainly visible in two lobes of the intestine, demonstrating that the alloy is being eliminated within 1 hour after feeding.

The next two sets of lantern slides depict the complete disintegration and elimination of alloy no. 17. The first picture, taken 1 hour after feeding, discloses the several large pieces of lead alloy still entire in the gizzard. In X-rays taken 24 hours later, complete disappearance of the original masses of alloy is evident. A very small amount of disintegrated lead is visible in the gizzard, but all the lead that has passed into the intestine has been completely eliminated from the birds. The third X-ray, taken after 3 days, shows no trace of lead anywhere in the duck.

There are two ways in which the magnesium-lead alloy could possibly be used as a basis for bird shot that will not cause lead poisoning in waterfowl. Since shot made of this allow and used without any surface treatment would disintegrate rapidly in water, the residue mixing with the mud would not be eaten by waterfowl. The rate at which the shot would disintegrate in natural waters can easily be regulated by the amount of magnesium present. If the rate were made rather slow, some shot would at times be eaten. The ingestion of such shot would be entirely harmless because the grinding action of the gizzard on the highly disintegrable alloy would quickly eliminate the poisonous lead. It is possible to balance the ingredients of this shot so that it will slowly disintegrate in water and remain hard in flesh. It has not yet been possible to prevent the alloy from becoming granular in flesh during cooking and therefore less easily removable from cooked flesh than the present lead shot. It cannot be stated without more experience in utilizing perfectly round shot whether or not this character is seriously objectionable.

A second method of utilizing magnesium-lead alloy for bird shot, which might be considered even more satisfactory, has also been devised. This method requires putting an outer shell of such metal as copper over the surface of a core of magnesium-lead alloy. Shot constructed in this manner would act in all respects like shot now in use, except that it would not produce lead poisoning when eaten by waterfowl. Such shot would not disintegrate in water, but would accumulate as do present shot. They would remain perfectly hard in cooked flesh, as do present shot. Grinding off of the surface coating by the gizzard would be entirely harmless. As soon as the surface coating was worn through in any one place, the interior of the shot would immediately become soft. Gizzard action would then quickly pulverize the shot and the lead would pass from the gizzard as in the case of uncoated shot. The only objection, apparently, to the practical use of coated shot is that technical operations in its

manufacture would lead to increased costs. Just how much the cost of ammunition would have to be increased by the use of coated shot of this type can be determined only by further experimental work under conditions of commercial manufacture.

Sufficient progress has been made by these investigations to assure a solution of the lead poisoning problem, if sufficient study and effort are expended. As yet no information is available as to the qualities of magnesium-lead alloy that determine it shotting properties for commercial manufacture. Such tests, of course, will soon be undertaken. At this time it appears that the most desirable shot made from this alloy would be a simple uncoated product which will disintegrate slowly in marsh waters and prevent accumulation. On the other hand, further studies and field tests may indicate that a copper covered shot would be more desirable. Answer to these questions must await further experimentation and actual field tests.

(Dr. Green showed slides illustrating the action of lead in the intestinal tract of ducks.)

DISCUSSION

Mr. C. H. Newcombe (Philadelphia). How many bullets did you find in the ducks which you tested. We have found as high as 278, and in some instances, 380. Will they gradually assimilate chilled shot?

Dr. Green. We have several times found more than 100 shot in a single gizzard. Usually there are from one to seven or eight, when any are present. Chilled shot are ground down in the gizzard and produce lead poisoning just as does drop-shot.

Question (name not given). What will be the effect of shot made from this alloy on the gun barrel?

Dr. Green. Its effect, so far as we can see, will be the same as that of ordinary chilled shot.

Mr. LeCompte (Maryland). Have you received any cooperation from the manufacturers in the use of this alloy?

Dr. Green. Just before coming to this conference I laid the matter before one of the ammunition manufacturers, but as yet have received no comment. We, of course, do not yet know what to recommend. We must have large amounts of shot made from this alloy for field tests before we will have any definite ideas as to practical application of the alloy to the manufacture of shot.

Mr. Lloyd. We have had a great deal of trouble with trumpeter swans. Most of them are wintering in Canada. We have lots of trouble with the lead poisoning. On one occasion not very long ago seven or eight swans were frozen out of the ground where they were wintering. They went to a duck swamp and got lead poisoning from duck shot. The problem is to prevent the birds from getting the old shot.

Mr. Kalmbach, Biological Survey. I was glad to learn of the progress shown by Dr. Green's experiments. It will have a great future providing we can overcome metallurgical difficulties that occur. It has an important bearing on waterfowl mortality. I have in mind lead shot already in the marsh to which reference has already been made. It has been my experience and that has been corroborated by others that very frequently lead poisoning appears in an acute form in areas where there is a deficiency of grit. I

have encountered lead poisoning on the gulf coastal area. Often only a fraction of a gram of grit was found in the digestive tracts of birds found dead of lead poisoning on the Delta area. It has occurred at the mouth of the Colorado and some along the Atlantic seaboard. It has appeared in virulent form where there is a deficiency of grit. I believe there is a certain correlation. A duck seeking lead shot may be seeking it for grit. If the lead shot is the only hard material on the water the duck will take it. On an area well supplied with grit, as on a gravel beach, there is little likelihood that the duck would take the shot. When a bird is present in a grit-deficient environment, it has the ability to retain the grit in its gizzard.

Regional Types of Response of Wildlife to the Sunspot Cycle

(By Ralph E. DeLury and John L. O'Connor, Dominion Observatory, Department of the Interior, Ottawa, Canada)

Fluctuations in the weather in response to the 11-year cycle in the numbers of sunspots vary with the nature of the geographical region. In general, temperatures are higher when sunspots are scarcest than when they are most numerous, with the range during the mean 11-year cycle depending on the region; near bodies of water it is usually smaller than at inland positions, reaching as high as 4° F., for example, in Alberta. In precipitation, however, a complete reversal of phase occurs. At oceanic points, such as Madras, Batavia, and St. John's, Newfoundland, about 20 percent greater rainfall occurs at sunspot maximum than at minimum in the mean cycle; while inland points, such as Montreal, Quebec, and Edmonston, Alberta, show, respectively, 16 percent and over 50 percent greater precipitation at sunspot minimum than at maximum. Other places, such as the British Isles and Anticosti Island, show two pulses on the mean 11-year cycle, while still other regions, such as Halifax, Nova Scotia, show little variation in the cycle when the yearly precipitation is considered, but in this case 6 months of the year are similar to the oceanic effect and the other 6 months resemble the inland-region type. Thunderstorms, a frequent cause of forest fires, with attendant destruction of wildlife, are in general more frequent at sunspot minimum than at maximum, the range in numbers depending on regional temperature and other factors.

It is to be expected that such regional weather types of response to the sunspot cycle would be accompanied by fluctuations of similar types in various forms of wildlife. The annual growth rings of trees reveal these types in striking fashion: For example, maximum growth at sunspot maximum in trees at New Westminster, British Columbia, maximum growth at minimum of sunspots in trees from Pentecost River, Quebec, and a double pulse in the mean cycle for trees from Matamek River resembling the precipitation cycle at Anticosti, nearby. Unfortunately numerical records of animals, birds, and insects are too scarce to permit as thorough a test as the trees afford, but such as are available show similar regional types. Thus in the records kept by the late Norman Criddle at Aweme, Manitoba, 1895–1929, we have found the inland type—that is, maximum numbers at or near times of sunspot minimum—in grasshoppers, sharp-tailed grouse, ruffed grouse, and rabbits. In the British Isles the double

pulse occurs in the mean cycle in grouse numbers (killed on the Scotch moors and revealed in the investigation of the grouse disease) in harmony with the double-pulse type of precipitation following the sunspot cycle. Dates of arrival of birds at Montdidier, France (Chandon records), are later at sunspot maximum than at minimum in harmony with the oceanic type of greater precipitation at sunspot maximum revealed in the March–April rainfall at the same point.

It would seem advisable, therefore, in plans for the conservation of wildlife that such regional differences in response to the sunspot cycle should be considered.

DISCUSSION

Dr. Green. Do these observations represent an average of several cycles?

Mr. Lloyd. No; they do not. Precipitation shows divided types.

Question. I have recently checked over our records in the Alaska region and they tally almost exactly. The etiology compares with Mr. Wing's almost identically when taken over large and conflicting areas depending on locality. These is no question but that the two men are thinking along parallel lines.

Mr. Lloyd. Particular detail must be worked from each general area. I think with all the splendid work that is being done by people like DeLury and others, we still lack a picture of the phenomenon of the cycle for the continent. You may be able to tell us what happens in the southern Rockies but an extensive survey of North America, if made, might amend the theory.

Dr. Green. I would like to send a message back to Dr. DeLury. I would like to see Dr. DeLury work out something on the mortality of these wild animals in Canada. It has been observed in the North Central States that unusual mortality has resulted to silver foxes in captivity. We know their location and food and it would be extremely interesting to see how those things work out. What is the cause of death in the animals if there is an appreciable mortality which has been described? Some of these matters could be brought together very nicely paralleling details on animals in captivity.

Mr. Steen. I found out that slight doses of irradiation cause variations in vitality of experimental subjects. (More extended discourse not recorded.)

Tetrameres crami Swales, 1933, an Important Parasite of Ducks in North America

By W. E. Swales, V. S., B. V. Sc., Ph. D. Institute of Parasitology, McGill University, Macdonald College, Province of Quebec

Tetrameres crami was first described as a new spirurid nematode parasitizing a domestic duck at Ottawa, Ontario. Since that time it has been found to be a common and important parasite of domestic ducks in Quebec and of wild ducks in Alberta and Quebec. It is probable that it is distributed in these hosts throughout North America.

Mallards, baldpates, green-winged and blue-winged teals, spoonbills, pintails, and American golden-eyes have been found infested in Alberta. In Quebec, black ducks, scaups, American golden-eyes, and a ring-billed duck have been recorded as hosts.

The few teals that became available for study in Alberta were heavily infested and were in poor health. The mallards and pintails were all lightly infested and did not appear to be affected by the parasite. Black ducks, scaups, and American golden-eyes in Quebec have been found to be seriously infested, particularly those obtained in the early autumn.

The adult female of all the known species of *Tetrameres* is peculiar both in habitat and shape. It burrows into the crypts of Lieberkühn of the proventriculus or glandular stomach and grows into a globular shape, effectively blocking the glandular ducts. Thus heavy infestations result in disturbances in protein digestion as well as the pathological changes brought about by the tissue feeding habits of the parasites and the local tissue reaction to their presence.

The females become blood-red in color, and their presence can readily be detected by opening and washing the proventriculus and holding it against a source of light.

The male remains as a colorless and typically vermiform nematode about 4 mm. in length. It remains in the mucous lining of the stomach and thus is difficult to detect.

Although the original description of *T. crami* was based upon the morphology of nine female specimens, subsequent studies have revealed distinct differences from its closest relative, *T. fissispina*, which also occurs in ducks and has been recorded from Europe, Africa, Asia, and South America. It is fairly certain that members of this easily recognized genus which are found to occur in ducks in North America will be found to belong to the species under consideration. Dr. Eloise Cram has elucidated the species of *Tetrameres* that occur in gallinaceous birds and to her must go the credit for having made the first complete study of the life history of one of these nematodes.

Life history studies at the Institute of Parasitology, Canada, have shown that two amphipods, or small fresh-water shrimps (*Gammarus fasciatus* and *Hyalella knickerbockeri*), act as suitable intermediate hosts. These crustaceans swallow the eggs of the nematode as they are passed in the feces of the infested ducks; the eggs hatch and the minute larvae migrate to the body cavity where, in from 18 to 20 days, they encyst. In approximately 12 days more they become infective third stage larvae, and if the amphipod is ingested by a duck they are able to infest the proventriculus.

Gammarus fasciatus lives on sandy beaches of rivers and lakes in from 18 to 24 inches of water. It is usually found on aquatic plants such as *Vallisneria spiralis*, *Chara* spp. and *Potamogeton* spp. Very favorable habitats in Lake St. Louis, P. Q., have been noticed to be the favorite feeding grounds of Scaups. The larval infestation causes this amphipod to become very weak, and it is frequently seen in the aquaria to be held captive by the surface tension of the water; in this position the infested specimens are easy prey for ducks.

Hyalella knickerbockeri occurs commonly in small bodies of water such as ponds, creeks, and bays which contain an abundance of green algae. In these habitats it probably acts as the most important intermediary in the infestations of domestic ducks and possibly black ducks. It does not appear to be affected by the infestations to a marked extent and due to its great activity is probably only in-

gested by ducks accidentally, in company with aquatic vegetation to which it clings.

Attempts to destroy amphipods by chemical means have not shown any great promise. They are only susceptible to dangerous dilutions of certain metal salts. The restocking of the waters with fish would probably bring about a reduction in the infestations of ducks, because the amphipods concerned constitute an important part of the diet of various fishes. Perhaps this is one more case where we have upset the balance of our fresh-water fauna and have indirectly caused a parasite to become an important cause of disease in higher animals.

An account of the morphological and biological studies on *T. crami* will appear in an early issue of the Canadian Journal of Research.

DISCUSSION

QUESTION. The reader of the paper said 72 percent in Canada carry worms, does he mean the specific worm discussed?

Dr. CAMERON. Worms in general, not the specific worm discussed.

Dr. SHILLINGER. What degree of loss may be attributed to the worm discussed in the water fowl that you examined?

Dr. CAMERON. I could not tell you exact figures. Quite a few of the ducks were emaciated. Experimental ducks died from this cause as revealed by the examination.

Dr. SHILLINGER. You do consider them a definite source of loss in wild water fowl?

Dr. CAMERON. Yes; I do.

RESEARCH IN WATERFOWL PROBLEMS

THURSDAY MORNING, FEBRUARY 6, 1936

Chairman: Dr. MILES D. PIRNIE, Director, W. K. Kellogg Bird Sanctuary, Battle Creek, Mich.

Committee: CLARENCE COTTAM, United States Biological Survey, HOYES LLOYD, National Parks of Canada, Ottawa, Canada, LOGAN BENNETT, United States Biological Survey

DUCK NESTING CARRYING CAPACITIES IN IOWA

(By Logan J. Bennett, U. S. Bureau of Biological Survey[1])

In order to present some facts and ideas that may be expanded to develop better management practices for the preservation of North American waterfowl this preliminary report has been prepared. The decline of waterfowl that began shortly after 1900 was climaxed by the severe drought of 1934. Until that time the true plight of our waterfowl was taken seriously by only a few ardent conservationists, who in great alarm called attention to the poor nesting conditions for waterfowl brought about by a lack of normal precipitation. These facts were forcefully called to the attention of the people who benefited directly and indirectly in the great sports of waterfowl study and shooting. As millions of dollars are exchanged each year in businesses that are closely associated with waterfowl, the present situation was recognized as a liability to thousands of American livelihoods.

Further, in working out proper land utilization and land-retirement policies to perfect a sound economic program for agriculture it was found in many cases that it would be more profitable to the people of the United States to perpetuate the waterfowl industry than to prolong the suffering and agony of humans trying to exist on certain areas where ducks and other waterfowl would thrive.

In accordance with these views an ecological study of the water birds native to the State was the first project in the wildlife research program inaugurated at Iowa State College in 1932 (Bennett, 1932). The purpose of this project was to obtain data that would be needed in formulating a sound waterfowl restoration program for the few remaining lowlands, marshes, sloughs, and lakes in Iowa that survived the drainage era. The data obtained during the course of these studies furnish the basis for this paper.

During the entirety of these waterfowl studies 340 puddle-duck nests and 31 diving-duck nests were observed. It was found that 95.6 percent of the puddle-duck nests were located on the land within 220 yards of the shoreline of the marsh, slough, or pothole, even though the actual grass or suitable nesting area extended beyond

[1] Iowa State College and Iowa Conservation Commission cooperating with the U. S. Bureau of Biological Survey.

that. Therefore, a margin of 220 yards was sufficient for practically all of the puddle ducks observed. In this paper, when figures on numbers of nests per acre are given they refer to nests per acre on a 220-yard margin, unless otherwise stated. From data obtained it is apparent that a protected margin of 220 yards around a marsh or slough is necessary to give an adequate nesting area for puddle ducks that may be inhabiting the adjacent waters. In Iowa, due to the grazing of the margins of water areas, the dominant upland plant is bluegrass. It was found that bluegrass 12 to 16 inches high offered excellent nesting cover for blue-winged teal, mallards, and shovelers. Undoubtedly if these bluegrass margins were protected from mowing and grazing they would revert to the prairie-grass climax. (For data on the prairie ecological plant formations of Iowa, see Hendrickson, 1930.) Another type of nesting cover found in Iowa was the semidry marsh with rank growths of cord grass, *Spartina Michauxiana*, and river bulrush, *Scirpus fluviatilis*. In this type the nesting cover was about 40 inches high.

Nesting was not uniform in distribution. The heaviest concentration of nesting ducks found on land was one nest per acre. On one nesting area of 21 acres, the cover chiefly cord grass, *Spartina Michauxiana*, 12 blue-winger teal and 9 mallard nests were observed. However, on several occasions on small ungrazed arms of one-quarter acre in size extending into a marsh, as many as three to five nests were found. Due to grazing and mowing in Iowa, the average marsh with some nesting cover had a nesting population of possibly one nest per 10 to 15 acres. As a rule at present, at least for Iowa, a nesting population of one nest per 5 acres is exceptionally high. From data obtained it would be difficult to say at this time what actually prevents ducks from nesting in numbers as high as 10 nests per acre over an entire usable nesting margin. It may be that ducks do not exist at present in large enough numbers to be found nesting in such concentrations. Territories and territorial difficulties in relationship to the shoreline and water are or may be the controlling factors in duck-nesting concentrations. The presence or absence of other game and nongame animals in the marshy habitats may also and probably are contributing factors in carrying capacities. The flora of a region also plays a very important part in duck-nesting requirements in regard to the range of a species, food, nesting cover, and rearing cover (Bennett, 1935a). Variations in migrating populations over respective migratory routes would undoubtedly affect nesting populations. The author recorded a wide variations in populations of respective species of shore birds through northwest Iowa in 1933 and 1934 (Bennett, 1935b). Similar variations in duck populations might mean heavy concentrations of nesting ducks one year and few the next or vice versa.

Throughout the course of the waterfowl studies the author had the opportunity to observe a large number of sloughs, marshes, and pot holes. Frequently on small sloughs and pot holes the number of ducks and ducklings was much larger in proportion to the water area than on larger marshes and sloughs. The pot hole duck nesting country of the prairie regions has been known for many years to have been one of the greatest duck-producing areas in the world (Phillips and Lincoln, 1930). It was naturally assumed that the reason for this was because of the many water areas with abundant

food and cover. Just why the pot hole areas should produce more ducks than a large marsh has not been explained, at least in literature. After obtaining complete nesting data on 340 puddle ducks some very significant facts became evident. In computing the nesting data it was found that 95.6 percent of the puddle ducks nested within 220 yards of the shoreline of a marsh or slough regardless of the size of such a water area. The 4.4 percent of nests beyond 220 yards was found at varying distances. In 1933 the author observed a mallard nest 2 miles from water. Both mallard and blue-winged teal nests were found occasionally 400 yards or more from water. It was on the basis of these data that a protected margin of at least 200 yards was recommended as necessary to produce near the maximum number of ducks (Bennett, 1935a).

When it was found that 95.6 percent of the puddle ducks in this area nested within 220 yards of the shoreline regardless of water area size, a relationship between shoreline length and the usable amount of nesting cover became evident. As an example let us figure the comparative shoreline lengths on a marsh approximately a mile square on a marsh a mile wide and 2 miles long. The smaller marsh would have a shoreline of 4 miles and the larger one would have a shoreline of 6 miles, although an area twice that of the smaller. If each marsh had a margin of 220 yards of nesting area, the smaller marsh would have 360 acres of usable nesting area to 640 acres of water as against 520 acres of usable nesting area to 1,320 acres of water for the larger marsh. The duck production would be much greater in proportion to the water area on the small marsh than on the larger one. Another example would be of two marshes of the same water area but different in shape. Let us take a marsh 1 mile wide and 10 miles long. The shoreline mileage would be 22 miles and with a 220-yard margin of usable nesting ground the marsh would have 1,800 acres of nesting area. The other marsh of the same water area but one-half mile wide and 20 miles long would have 41 miles of shoreline with 3,320 acres of nesting area. Theoretically, if each area was carrying one nest per acre the long narrow marsh would produce 86 percent more ducks than the other marsh of the same water acreage. Using this same principle on pot holes down to one-half acre in size it becomes evident why a pot hole produces more ducks per acre of water than pot holes and marshes of larger size.

What size slough or pot hole is the optimum for puddle duck production could not be stated at this time. From available data it seems as though a pot hole of one-half acre is near the optimum. The suitability of areas smaller than one-half acre in size for maximum duck production would be determined by sufficient water depths for food and rearing cover plants.

O. C. Furniss (1935) made a survey of the numbers of duck broods seen on 16 quarter sections of land on 99 pot holes near Prince Albert, Saskatchewan. The area examined was pot hole country, the size of pot holes varying from one-half acre to 12 acres in size (table I). From his data the size of pot holes that produced the most broods per acre of water was the group of pot holes of one-half acre in size. The one-half acre areas had one brood per 2.6 acres of water while the largest area, a 12-acre pot hole, had one brood per 12 acres.

TABLE I.—*Brood counts on pot holes from Prince Albert, Saskatchewan*

Number of pot holes	Size (acres)	Broods	Total acreage	Acres per brood	Number of pot holes	Size (acres)	Broods	Total acreage	Acres per brood
16	½	3	8	2.6	4	5	2	20	10.0
30	1	7	30	4.2	4	6	3	24	8.0
19	2	9	38	4.2	3	8	3	24	8.0
10	3	8	30	3.7	4	10	4	40	10.0
8	4	6	32	5.3	1	12	1	12	12.0

These data of brood counts on varying sizes of pot holes substantiates the principle set forth above that the ratio of shore line to the water area has a definite relationship to the amount of useable nesting area.

Due to the lack of funds to restore and perpetuate even a small portion of the remnants of duck breeding areas in Iowa it is hoped that this paper will aid in the selection and restoration of waterfowl areas. These data indicate that if two areas are being considered and one is pot hole country and the other is a large marsh and only one can be purchased, the pot hole area is the one that should be obtained for the greatest duck production providing similar conditions prevail. If a long narrow marsh is being considered against a round or square marsh, both of the same approximate water acreage, the former would be the logical one to purchase.

In the actual management and restoration of a marsh much could be done in most cases to lengthen the shore line in respect to the nesting territory. Such practices as building arms of land into a marsh and the construction of islands would give the desired results. In artificially lengthening the shore line it should be done in such a way that the surface soil on such extensions or islands be conducive to the growth of nesting cover. It often happens that in the digging and throwing up of soil for islands and arms that the surface soil is sterile for many years.

SUMMARY

1. The shore line length of a marsh or slough has a direct relationship to the nesting area.
2. The longer the shore line in proportion to the water area the greater the acreage of nesting area.
3. The ratio of shore line to water area is an important factor in determining desirability of areas and in planning improvement of duck nesting areas.

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Eelgrass and Other Waterfowl Foods—Present Status and Future Prospects

(By Harrison F. Lewis, chief Federal migratory bird officer, Ontario and Quebec; and Clarence Cottam, senior biologist, U. S. Bureau of Biological Survey)

At the last two annual conventions of the American Game Association, the predecessor of the North American Wildlife Institute, reports were presented on the eelgrass situation. It is assumed, therefore, that the history and importance of this plant disease is well known to members of the conference. Consequently, it seems unnecessary to point out the many intricate relations that this submerged, saline aquatic pond weed bears to other forms of life. It will be recalled that its precipitate and nearly complete disappearance has apparently seriously affected sea brant and other coastal waterfowl, as well as the fishing and shellfishing industries. It should be remembered that the disease gravely affected the plants on the American and European Atlantic coasts, while the same species of plant (*Zostera marina*) occurring on the American and Asiatic Pacific coasts is as yet unaffected.

EELGRASS CONDITIONS ON THE ATLANTIC COAST OF CANADA IN 1935

Every year since the eelgrass on the Atlantic coast of Canada was largely destroyed by disease there has been much vigorous new growth of the plant in summer, unfailingly giving rise to newspaper reports that this important waterfowl food was "coming back." Every year, in the interval between late August and the following spring, most of the new growth has succumbed to the disease, with the result that, considering the coast as a whole, there has been no permanent improvement in the condition of the eelgrass.

Fluctuations of this type were repeated in 1935 by the eelgrass of the eastern Canadian coast. In this year, the new growth seemed to be a little larger and more plentiful by mid-August than was the case in previous years, but the subsequent destruction by disease was as devastating as usual, so that by mid-December the eelgrass was, on the whole, no better than it was a year earlier.

At Isle Verte, Quebec, on the south shore of the estuary of the St. Lawrence River, are extensive tidal flats which were formerly renowned, both for the large harvests of eelgrass which they produced, and for the great flocks of Canada geese and brant which gathered there during migration to feed on the eelgrass rootstocks. Personal examination of these flats by Lewis, in October, in each of the past 3 years, is the basis of the following comparative data:

October 24, 1933: Fifty percent of the flats estimated to be covered with eelgrass, which was short and diseased; remainder of flats bare.

October 3, 1934: Ten percent of the flats estimated to be covered with short, diseased eelgrass; remainder of flats bare.

October 17, 1935: Only a small fraction of 1 percent of the flats covered with short, diseased eelgrass; remainder of flats bare.

What little eelgrass is now to be found on the Atlantic coast of Canada is chiefly in areas where the salinity of the water is much below the normal salinity of sea water.

There appears to have been some increase of wigeongrass (*Ruppia*) in areas vacated by eelgrass, but not enough to furnish more than a small fraction of the waterfowl food formerly furnished by eelgrass on the same areas.

Whether or not eelgrass will eventually return to its former abundance on the Atlantic coast of Canada no man can say. So far there is no evidence of any permanent or worth-while improvement in its condition or its abundance. The chief hope of bringing about, by human intervention, an improvement in the situation as it affects brant and geese appears to lie in attempts to introduce on the denuded tidal flats disease-resisting eelgrass or other suitable waterfowl food plants from other regions.

CONDITIONS ON THE ATLANTIC COAST OF THE UNITED STATES

While no complete or detailed survey of the eelgrass situation along the Atlantic coast of the United States has been made for several months, the evidence at hand indicates that even though conditions are still serious and alarming they are not quite so unsatisfactory as they seem to be along the Canadian coast. It may be reported that conditions are still extremely variable, many areas being no better than they were 6 or 12 months ago and some being even worse. Evidence of the disease appears to persist in every section, although the plants in some localities may be developing an immunity against it or else a strain that is more resistant to the disease is appearing.

In much of the Chesapeake Bay section of Virginia and Maryland the plant has returned to almost normal condition and during the past season has been sufficiently abundant to be washed ashore in sizable windrows and to be gathered for packing crabs and other shellfish. In general the best return of the plant has been restricted to areas of reduced salinity, such as the more inland coastal bays and estuaries and the mouths of large rivers. Most of the more open coastal bays have shown little or no improvement. Each year at many places during the growing season an encouraging improvement has been noted. Much of this, and in many areas all of the new growth, has been entirely laid waste as fall progressed. Extensive flats that formerly supported a dense stand of the plant became shifting sand flats when the disappearance of the eelgrass left the firmer soil exposed to erosion.

Fortunately many of these flats that formerly supported a dense stand of the plant became shifting sand flats when the disappearance of the eelgrass left the firmer soil exposed to erosion.

Fortunately many of these flats are now being covered with wigeongrass (*Ruppia maritima*), which is serving both as an effective check for moving sand and as a food for coastal waterfowl. This plant-

food is restoring many of the ecological associations that existed before the onset of the wasting disease of the eelgrass. Consequently waterfowl food conditions are noticeably improved along much of our coast, particularly in the more southern areas, including Pamlico Sound of North Carolina.

Only time can tell whether eelgrass will ultimately reestablish itself as it formerly was along the Atlantic seaboard. The solution of the problem may lie in the introduction of resistant varieties of eelgrass. Last fall the Biological Survey obtained seeds and plants of the west-coast variety and planted them at appropriate situations along the Atlantic coast. Furthermore, transplantings were made of healthy plants that had become well established in Chesapeake Bay to areas in the more open coastal bays where little or no return had occurred. It is too early to give the results of these experiments. Additional plantings of Pacific coast plants and seeds will be made again this spring in an effort to restore the eelgrass on the Atlantic coast. If these efforts fail, attempts should be made to introduce other species of eelgrass from the Asiatic and European coasts.

The abundance of other waterfowl foods varies slightly from year to year. Reclamation, drainage, mosquito control, pollution, drought, and agriculture have destroyed many favorable waterfowl areas. Consequently the supply of appropriate duck foods has, to some extent, decreased with the increase and expansion of our population and the advance of civilization.

The Federal Government in its refuge program is at the present time making every effort to acquire and rehabilitate some of the more important waterfowl areas. Even though there naturally has been a reduction in the quantity of waterfowl foods throughout the United States, with localized areas having an obviously inadequate supply, this diminution of foods has not been proportional to the decrease in waterfowl population. Consequently there undoubtedly is as much food per bird today, with the exception of the Atlantic sea brant, as there ever was. Furthermore the supply of acceptable foods can be increased with less effort than is required to increase the waterfowl population. If the destruction wrought by human agencies can be prevented there need be little fear for a bounteous supply of acceptable waterfowl foods.

ABUNDANCE AND CONDITION OF AMERICAN BRANT AND CANADA GEESE ON THE ATLANTIC COAST IN 1935

CANADA

Reports obtained by the Canadian Department of the Interior from its officers, from the Royal Canadian Mounted Police, and from organized voluntary observers on the coasts of Nova Scotia, New Brunswick, Prince Edward Island, and Quebec indicate that the status of American brant and Canada geese in those regions in 1935 was as follows:

Canada geese were present on migration in both spring and fall in numbers that differed little from those recorded with reference to them in 1934. They are only a small fraction of the numbers of this

178139

A, Nighthawk resting during the day in Wyoming National Forest. (Forest Service photo.)

186932

B, Young great horned owls in Grand Mesa National Forest, Colo. (Forest Service photo.)

164482

A, Ground squirrel, also known as big chipmunk, at lunch in Cleveland National Forest, Calif. (Forest Service photo.)

164527

B, Gray squirrel on Mount Lowe, Cleveland National Forest. (Forest Service photo.)

species that occurred on migration in this region under normal conditions six or more years ago, before the supply of eelgrass began to fail.

Only a few thousand American brant appeared in the spring and fall migrations through this region. Their numbers in the spring of 1935 appeared to exceed somewhat their numbers in the spring of 1934, but in the fall of 1935 they were notably scarcer than in the fall of 1934. What remain is only a very small percentage of the numbers of these birds that frequented these regions on migration in 1930 and preceding years.

Very few American brant or Canada geese were killed by hunters on the Atlantic coast of Canada in the fall of 1935. Seven brant which were taken by two hunters from a flock of a thousand at Isle Verte, Quebec, were so thin that they were considered unfit for food.

It is believed that the present extraordinary scarcity of eelgrass on the Atlantic coast of this continent is the condition chiefly responsible for the reduced numbers of Canada geese and American brant on that coast and for the poor condition of individuals of the latter species.

THE UNITED STATES

Inasmuch as the American or Atlantic sea brant follow along the Canadian coast before reaching the United States the numerical status of the birds in the two countries would necessarily be similar. While all the facts are not yet available regarding the abundance of these birds in the United States, the information at hand offers little encouragement. A slight increase over the alarmingly low numbers of last year is reported for Pamlico Sound, with a proportionate decrease for other sections of the coast. Atlantic coast geese, particularly in the southern part of their range, have probably increased slightly. This increase seems to be due to birds going to the coast from the interior of the country rather than to birds migrating along the coast from Canada.

SOME IMPORTANT WATERFOWL FOODS

Discussion of waterfowl foods in this paper has thus far dealt only with eelgrass. It should be pointed out that while this plant is the principal vegetable food of a number of coastal waterfowl and under normal conditions formed more than 80 percent of the winter, spring, and autumn food of the American or sea brant, it is only one of many plants that can properly be listed as being of great importance to waterfowl. With it, wigeongrass (*Ruppia maritima*) normally occurs along the coast in brackish water.[1]

Michigan Waterfowl Management Studies

(By Dr. M. D. Pirnie, director of the W. K. Kellogg Bird Sanctuary for the Michigan State College.)

Michigan's conservation department began its waterfowl studies in 1928 not due to any alarming shortage of waterfowl or marked

[1] Comments concerning the importance and distribution of each of the more important brackish- and fresh-water plants were presented as 60 slides were shown.

decrease of good hunting, but rather to determine whether local supplies of duck foods might be materially increased by artificial plantings; for numerous hunters were then claiming that ducks would be more numerous and would stay longer if special foods were planted. Since these duck-food investigations and the several other waterfowl studies accomplished since 1928 by the department of conservation and by the W. K. Kellogg Bird Sanctuary have been set forth in considerable detail in a recent book,[1] it is not necessary to repeat more than the most significant findings at this time. We may mention, also, what kinds of projects seem most worthwhile for future study, not only for Michigan but also in other States which have a goodly heritage of wild waterfowl now deserving careful management.

The Michigan field studies and observations naturally have dealt with such topics as local food supplies, waterfowl reaction to half-day shooting or complete refuges, habits of migration and dispersal, and possible restocking and restoration. The distribution and abundance of nesting waterfowl should be investigated further, but owing to the nature of Michigan water areas these cannot be inventoried as easily as can the prairie lakes and marshes. The leg-banding of Canadian geese and of local and migrant ducks should be continued as part of the study of the value of protective laws and regulations, and also to help discover variations or trends in migration behavior. Experimental refuges, certain food planting experiments, and restocking with geese and mallards, and perhaps other species, might well be experimented with in all waterfowl States; for only in this way—by such management—may the relative merits of the various suggested aids to waterfowl be properly evaluated. (But to return to the Michigan studies. Which seem most significant?)

DUCK MORTALITY STUDIES AND SHORTER SEASONS

Nearly 10,000 wild ducks have been leg-banded in Michigan since 1928, and approximately 20 percent of all these ducks have been reported shot by hunters or taken in muskrat traps. To this loss must be added a liberal quota for birds carrying bands and which were shot but not retrieved, or not reported when recovered by hunters. The taking of "capital stock" rather than "interest" only, cannot be kept up indefinitely. It appears that perhaps for years we have been making the fatal mistake of destroying close to half of our game waterfowl each year by shooting; and under the most optimistic calculations, a survival of only 50 or 60 percent is not enough!

Table I, printed below, is based on the reported kill of wild black ducks caught and banded before, during, and just after the short, 1-month (October) open season of 1931. Note the evident greater survival for the 1932 nesting season of those ducks banded after the close of the 1931 shooting season; and this added nesting opportunity is unquestionably ample justification for trying to increase the wild breeding stock by controlling shooting. The gun as a mortality

[1] Michigan Waterfowl Management, by M. D. Pirnie; $1.50 postpaid from the Department of Conservation, Lansing, Mich.

factor affects waterfowl which have survived risks from natural enemies and disease, and which are potential breeders for the next season crop. Restricted shooting evidently pays dividends in greatly increased opportunity for sport in future years—provided the ducks saved from shooting can find suitable nesting and feeding habitats, our next consideration.

TABLE I.—*The benefit of shorter open seasons, as indicated by the reported shooting season mortality of black ducks leg-banded at the W. K. Kellogg bird sanctuary before, during, and after the October shooting season in 1931*

When banded in 1931	Total banded each period	Shot in 1931	Shot 1932–34	Total reported kill
Before Oct. 1	400	35	40	75
During October:				
Oct. 1–15	251	31	39	74
Oct. 15–31	100	4		
After October: November–December	437	[1] 2	[1] 64	66

[1] Note low first year kill of ducks banded after Oct. 31, the close of legal Michigan shooting; also note heavy subsequent kill, proving many of the birds had survived for the 1932 nesting season.

DUCK-FOOD INVESTIGATIONS

Admittedly ducks must eat; and waterfowl-food inventories are properly a part of the management program. Field examination of weed beds in streams and lakes in many parts of Michigan have discovered a far richer supply of natural duck foods (animal as well as vegetal) than had been reported by the hunters or even guessed at by the Conservation Department itself. Michigan has not been faced with a duck-food famine!

Combined baiting and refuge studies (aided by trapping and leg-banding studies) have shown that some ducks leave the refuges even when a good variety of foods is at hand, and in spite of the protection offered; but we also know that fair numbers of waterfowl may become steady boarders at refuge areas and may remain far north well after the close of shooting seasons, especially where a considerable water area remains open or wheat and corn fields are not covered too deep by snow.

Experimental plantings of wild rice and duck potato (Sagittaria) revealed the seriousness of muskrat or waterfowl damage to such plantings when other foods are scarce; and also these experiments have emphasized the fallacy of expecting new plantings to succeed always, regardless of dense plant growths previously established. Carp have not been as destructive to duck-food supplies in Michigan as may be true elsewhere!

NESTING AND RESTOCKING

Although in Michigan and elsewhere, drought and drainage have reduced the available acreage of nesting marshes, yet there has seemed to be a dearth of ducks on apparently suitable breeding areas. Repeated "plants" of captive-bred mallards have as yet failed to prove, however, the suitability of these marshes for wild-duck nest-

ing; and neither have the Michigan releases of mallards proved the value of artificial propagation in speeding up restoration. Unquestionably, State game farms should continue to contribute to this vital study by growing birds for experimental releases and for use in studies of waterfowl disease—a topic which is too often slighted.

DISEASES AND PARASITES

Several serious diseases occur among wild ducks in Michigan. How serious they are has not been ascertained. Captive broods of black ducks and golden-eyes, however, have matured where certain foreign species have failed to survive, suggesting that disease may at times become the limiting factor, restricting certain waterfowl species to very small breeding ranges; and, conversely, resistance to disease may in part account for the extensive ranges of such species as the mallard and black duck.

Parasites which prevent the breeding of adult ducks which have escaped the gunners may prove to be a serious factor. A study of one such parasite has been undertaken by a graduate student of Michigan State College doing his work at the W. K. Kellogg Bird Sanctuary. There is room and need for many such investigations, for we cannot plan wisely for more waterfowl without a better knowledge of all known mortality factors.

NATURAL ENEMIES

The Michigan observations fail to indicate serious losses of healthy, uncrippled waterfowl by predators, except in the case of incubating birds. Turtles and horned owls seem to rate as perhaps the most common enemies of ducklings, but dogs, mink, and many other species also count at times.

Crows have taken very few clutches of duck eggs from nests observed in ungrazed, dense cover. There is some evidence that even the fox squirrel at times steals eggs as large as those of the mallard and wild turkey, and all losses blamed on the opossum and 'coon may not be due to these recognized nest raiders. The value of many predators as fur or game and in controlling rodent pests calls for a recognition of the "multiple use" idea in management of most areas, even perhaps on special waterfowl areas. Moreover, predator control is so expensive and so likely to damage valuable wildlife that we should guard against overemphasizing these losses caused by natural enemies.

SUMMARY

The results of the Michigan waterfowl studies prove the value of even small-scale or limited investigations, provided they are pertinent to fundamental inventories and other phases of management. Each State can and should supplement the waterfowl studies of the Federal workers, and all should work together to possibly unravel the tangles of wildlife and human ecology.

Dr. Pirnie remarked, in conclusion, that a few of the States have done a little in duck-food research. He said, "Don't plant things in the food beds that don't belong there."

Mosquito Control and Waterfowl

(By W. S. Bourn, U. S. Bureau of Biological Survey)

Mr. Darling, in his address to this conference a few days ago, made the statement that "restoration of wildlife is synonymous with restoration of environment." With this, I believe, we all agree. In the case of "mosquito control and waterfowl", however, we are concerned more properly with the conservation of an environment than with its restoration. This discussion will be limited to the effects of mosquito-control operations on the environment of waterfowl and will not include the broader aspects of mosquito control and waterfowl as such. We are concerned here with the conservation of swamps and marshes, the primitive types of natural habitat yet left to wildlife on this continent.

Ditching and draining swamps and marshes in this country for reasons of health and economy is a practice as old as the Nation itself. Since George Washington excavated the first ditch in Dismal Swamp, the idea seems to have expanded and spread with the country's population, until recent years, when the liberal allocation of public funds apparently has supplied a fresh and added impetus to the ditching of our marshes for the purpose of ridding them of pestiferous and disease-bearing mosquitoes. This operation has progressed to such an extent that many of the Nation's conservationists and sportsmen have become exceedingly alarmed lest vast areas of natural habitat be forever ruined for many valuable forms of wildlife.

We who are charged with the conservation and protection of wildlife in this country recognize in the fullest sense the need for mosquito control, for we are well aware of its healthful, its economic, end even its comforting values. We wholeheartedly approve mosquito control whenever or wherever it contributes to the alleviation of human misery. We are opposed, however, to all ill-advised or improperly supervised projects that bring about a needless waste of wildlife habitat. Far too much of this type of destruction has already occurred in this country. The results are too familiar to warrant further comment here. All of us have knowledge at least of the gross results of drainage.

Since it is necessary for human comfort and well-being to have mosquito control, we are concerned primarily with its extent and methods. We are interested, therefore, in determining a method of effectively and successfully eradicating mosquitos that at the same time will not seriously injure the environment of desirable forms of wildlife. Furthermore, we are seeking methods of effective mosquito control that may at the same time improve natural wildlife habitat.

Of various methods of mosquito control, we are devoting our attention at present to that of altering the natural water levels in the marshes, as this is the method most commonly employed in mosquito-control operations. The alteration of these natural water levels is accomplished partly by diking and impounding water, which raises the level over a given area, but mostly by systematic ditching, which, at least in a great percentage of areas, permanently lowers the natural water levels. It must be remembered, however, that much

of the mosquito-control work along the Atlantic coast is practiced in tidal marshes, where water levels may not be permanently changed, but may only fluctuate with the tide. Nevertheless we desire to know the ecological and the biological effects of changing the natural water levels. Toward this end we have selected suitable sites in Delaware marshes for the study of the effects on the natural flora and fauna of a wide range of water-level conditions and extensive and intensive experiments are already under way. It is only by experiment that we can obtain the essential facts on the ecological effects of mosquito-control operations. It has been written that "science has only one language, that of experiment; only one argument, that of quality." We are striving for facts and not mere opinions.

It may be appropriate to state here that Delaware was selected for most of our experimental work, not only because of its suitability and convenience as to sites but also for the reason of the close cooperation given us in our studies by Col. W. S. Corkran and his efficient organization occupied in mosquito-control work.

In these studies we are guided by many facts already known on marsh ecology. For example, we have available information on the natural succession in the plant life in the coastal marshes, but we do not have adequate experimental knowledge of the subject, especially the effects of ditching on the natural processes of succession. We also have a considerable amount of information on the relation of plants to tide levels. We know that waterfowl, to exist, must have food, water, shelter, and a chance to reproduce. We have gathered much information on the food and other habits of waterfowl. We know their most valuable food plants. We know the characteristics of these plants and the optimum conditions for their growth. For example, we know that these plants possess fibrous root systems, and we have determined experimentally that many of them grow best in a waterlogged soil with water standing over the soil to a depth of 2 centimeters or more. We know that when this level is lowered even as much as an inch certain of these important plants cede the advantage in the struggle for existence, frequently to less desirable species. We know that the process of lowering this level, either temporarily or permanently, by ditchings insofar as these particular plants are concerned, is best recognized as gravity drainage, pure and simple. We further know that these food plants are made available to most waterfowl only through the medium of water, and when the water is removed the value of any plant as food for waterfowl is considerably lessened, to say the least.

The purpose of our experiments, however, is to obtain facts not already known. We want to determine at least the chief factors underlying the establishment and maintenance of plant and animal societies in the marshes, and the interrelationships of these societies, and the effect of mosquito-control operations upon them. In this connection we have obtained the cooperation of such agencies as the Division of Tides and Currents of the United States Coast and Geodetic Survey, the Bureau of Entomology and Plant Quarantine, the Bureau of Chemistry and Soils, the United States Forest Service, and various State organizations in New Jersey, Delaware, and Maryland.

In Delaware, where we have been able to obtain adequate and suitable check-plots for each ecological factor desired for study, we have already mapped the vegetation now existing over a considerable area, and have established transects and quadrants for detailed studies and comparisons at regular intervals. These cover a wide range of water-level conditions. In regard to the study of the effect of these various levels, both permanent and fluctuating, on ecological changes, the Division of Tides and Currents supplied and supervised the installation of such apparatus as automatic recording tide gages, tide staffs, current waters, and so on. Along with the study of the effects on marsh ecology of different permanent tide levels, we are making measurements of the physical and chemical changes of soil and water and the correlation of these changes with weather and meteorological conditions. These studies include especially measurements of salinity, temperature, and reaction of the soil and water, and also changes in soil structure. In Delaware the methods of ditching and diking and the system of tide gates employed in mosquito-control work are particularly suited for comparative study of ecological changes. Furthermore, the methods of ditching and controlling water levels are more or less flexible, and it is not difficult to obtain a given set of experimental conditions. In New Jersey with the cooperation of Dr. T. J. Headlee, the State entomologist, and the New Jersey Game and Fish Commission we have planned a series of experiments to determine the effects of ditching on the ecology of salt-marsh ponds. From the standpoint of waterfowl, ponds are probably the most valuable feature of our Middle Atlantic coastal marshes, especially fresh-water ponds, which supply both food and drink, and salt-marsh ponds, which often contain important quantities of *Ruppia maritima*, a plant of considerable economic importance to various forms of animal life. Two series of four ponds each will be constructed in a typical salt marsh. These will vary in depth from 1 to 4 feet, one series will serve as a check, and the other will be connected with the regular ditch system operating as a mosquito control. All ponds will be stocked with equivalent amounts of plants and killifish and continuous records made of the growth and reproduction of these organisms and their correlation with mosquito breeding and emergency, as well as with physical and chemical changes brought about in the water by ditching and weather conditions. From these pond experiments we hope to obtain some definite information on such points as the reduction of excessively high temperatures and salinities, which naturally occur at times in summer in salt-marsh ponds and which necessarily retard plant and killifish growth and thus favor directly and indirectly increased mosquito production. We have also planned experiments in New Jersey to determine what marsh plants suitable for food and cover for waterfowl may be found adapted for growth on ditch banks to replace the worthless *Iva and Baccharis* shrubs that usually start on the spoil banks of marsh ditches and soon spread from there over an entire marsh.

While a general outline of what we are doing and propose to do in order to get fundamental facts on effects of mosquito-control operations on wildlife has been presented here, I shall be glad to go into detail on any point.

At the conclusion of these experimental studies we hope to possess sufficient facts to predict accurately the results on the ecology of the marsh of any mosquito-control ditching system. At the present time we do not have sufficient experimental facts to warrant many conclusions on the effects of ditching on wildlife. In this case we feel that it is inadvisable to offer opinion based upon casual observations. Such observations made in one region cannot always be applied to others. We must have knowledge of all the facts in connection with mosquito-control operations before we are safe in saying what methods may be practiced effectively to eradicate mosquitoes and not be injurious to wildlife or natural habitat. When we can do this, mosquito-control work will largely become an engineering problem. In the meantime we ask the cooperation of every group involved and concerned with mosquito control. While we have no desire to condemn unjustly any project, we do not propose to give approval to every straight out-and-out gravity-drainage project that unnecessarily destroys a natural wildlife habitat.

When we find out the facts of the effects of mosquito-control operations on marsh ecology, we hope our recommendations will be followed by every control group. Most of those now so engaged are cooperating with us and are willing to correct, as far as possible, the effects of any injurious factor.

DISCUSSION

Dr. R. D. Glasgow (State entomologist, New York State Museum, Albany, N. Y.). In commenting upon Dr. Bourn's paper, we must reserve judgment. We accede that there is a problem here but we feel that Dr. Bourn's remarks indicated the data at present available are not sufficient to warrant sweeping conclusions concerning the problem one way or the other. Instead of opening a discussion, I should like to sketch briefly a background so that any discussion that may come up may fit in its true perspective.

In changing the population of any area with reference to any one species, or more than one for that matter, we are dealing with an organism in which both physical and biological factors are concerned. If we attempt to control mosquitoes by introducing changes in the system of facts that appear anywhere where mosquitoes may be an object of concern, we set in motion a series of parallel changes that have to be taken into account and if those parallel changes are factors that are concerned with the welfare of waterfowl or other wildlife, then we have our problem before us. It is the result of the forces concerned and it is in process of constant change in response to the changes in the physical factors of the environment and changes introduced otherwise. In response to the seasonal changes there may be changes all along the line with reference to mosquitoes and waterfowl affecting all the factors associated with these two groups of organisms.

Dr. Bourn outlined a series of experiments. He very concisely pointed out the fact that the conditions under which these experiments are carried on does not represent all the conditions undoubtedly and they should be carried on into other regions. The range of the problem varies between wide extremes. Sometimes we have a drop of a foot and other places of 6 or 8 feet along the Atlantic

coast and where the tide range is more in variation the problem is varied and the experiments which Dr. Bourn has begun should be conducted until they represent a series of representative areas that will answer any question that is likely to be raised. This shows the danger in dealing with a controversial question. I think the data should be interpreted in a limited way because there are conservative investigators, biologists, and even sportsmen whose interest may be more limited in the problem than it is with many of us. We should reserve judgment until work like Dr. Bourn has been doing and other work that may be added to it may be carried further.

Upon the completion of this talk, Dr. J. L. Webb, Bureau of Entomology, said he would like to ask what effect mosquito control had on muskrats in Delaware? Dr. Bourn said it improved their habitat. * * * It also endangers the muskrat and will lead to extermination. These ditches afford him much more protection and also solves his traffic problem. It gives the trappers an opportunity to go into the marshes and trap them more easily than before and it looks as though muskrats will be exterminated if nothing is done about it.

Mr. A. D. Morrill, National Park Service, asked the average foraging distance of mosquitoes from their breeding ground. Mr. Cottam said it traveled one-half to one mile and if in a stiff wind it can be carried as far as 40 miles. They do not travel in large numbers and in normal conditions they don't go beyond 3½ miles.

Mr. W. C. Corkran, executive officer and engineer, Mosquito Control Commission, State of Delaware, presented slides and a brief explanation of the work in Delaware. Hhe said the Biological Survey will find out that mosquito-control work will be the best friend of the Survey. It prevents the killing of vegetation which both the waterfowl and muskrats must have. He explained that the ditches did not destroy the food but helped to circulate the fish. They are our best allies. He said we must not forget the muskrats, which means more living and money into the State of Delaware. We must look at the economical value.

Waterfowl Populations

(By Frederick C. Lincoln, U. S. Bureau of Biological Survey)

As never before, the subject of wildlife populations is today engrossing the attention of sportsmen, conservation administrators, and scientists. The reason is, of course, entirely obvious, for, while scientific men have repeatedly sounded the note of alarm, it has only been within the last few years that the depletion of the stock of most game species has become apparent to anyone willing to see with unbiased eyes. Unfortunately, there are still many who, for reasons of selfishness or plain ignorance, or (if occupying official positions) for reasons of political expediency, refuse to read the blazing writing on the wall and continue to loudly proclaim the mischievous doctrine of the existence of more—ducks, geese, grouse, quail, deer, or what have you—than ever before. They want to believe what they shout from the housetops and in some cases seem able to succeed not only in convincing themselves but in rallying many others under their banner.

While the subject is one that can be discussed adequately for almost any species of game, whether it be mammal, bird, or fish, as well as for many species in these classes that are not considered game, the present paper is confined to the subject of migratory waterfowl, which has been the subject of special attention on the part of the speaker.

In considering waterfowl populations it always should be borne in mind that our ultimate objective must be the continental population. While the technicians and administrators of a State conservation commission can study their local populations of deer, grouse, quail, or pheasants and arrive at conclusions that will enable them to adopt a sound regulatory policy, even though this be at wide variance with that of a neighboring State, studies of the waterfowl populations of individual States must be correlated with similar studies conducted in representative areas throughout the entire range of the birds. The reason, of course, is found in the migratory habits of the aquatic birds.

Considering, therefore, that we are dealing not with the population of a single State or even of one country but of an entire continent, and that, even in its greatly reduced condition, this population consists of vast numbers, we immediately encounter what seems to be a natural quirk of the average human animal and which is the cause of almost endless difficulties. I have reference to the mental effect of these large numbers. It appears demonstrable that there are very few persons who can grasp the picture of a million of anything, whether it be men, ducks, or dollars. The speaker has repeatedly visited areas where according to the enthusiastic reports of local observers, ducks were present "by millions", only to find that the reported concentration needed to be discounted anywhere from 50 to 90 percent. It is not always a deliberate attempt to pad the account, but usually means that the mental processes of the observer produced a figurative brainstorm when his ears heard the roar of wings and his eyes saw the cloud that was made as 10 to 50 thousand birds took to the air.

Such being the case, the obvious question is: Can accurate estimates be made of a continental migratory wildlife group? In the opinion of the speaker, the answer is "Yes, for practical purposes." It is necessary, however, to stress the word "estimate." During recent years the term "census" has been widely used in wildlife numerical computations. In most cases it is an unfortunate choice of words since it implies actual count or enumeration after the manner of the census taking of the human population of a political unit or subdivision thereof. It is true that under conditions of small areas with small populations such individual counts are sometimes possible, but where a species or group of species totaling many million individuals occupies an area of tens of thousands of square miles, much of which is covered with aquatic vegetation so dense as to completely conceal a large portion of the life it carries, the impossibility of attempting an actual numerical "census" is obvious. In our opinion the summer is the time for slow methodical examination of individual sections of representative habitat with careful study of the various factors that inhibit breeding in the area or that reduce the potential increase. In conducting such investigations an actual count or census on the areas studied is sometimes not only possible

but highly desirable, as the worker is actually living with these birds day after day. To him each female duck becomes an individual in fact, and the trials and tribulations that beset her as she endeavors to produce her brood and put it on the wing become matters of first importance. Also, in these limited areas of intensive study an actual count of nesting birds is important in the attempt to ascertain the carrying capacity of habitats of different types. There is no reason why, when adequate studies have been completed, a trained investigator should not be able to visit any area in the breeding range of a species, determine its size and environmental type, and then state the approximate number of birds it should be supporting. Some of this information is already available and within the next few years it should be greatly augmented by studies conducted upon the newly created refuge areas in the United States and upon the vast breeding grounds in Canada.

Utilizing, to the best of its ability, the facilities at its disposal, the Biological Survey has for several years conducted studies on the waterfowl breeding grounds. The work of the past summer will serve as an example, but before detailing the breeding season investigations it seems necessary to present the figures indicative of the preseason population and which were obtained during the winter following the closing of the shooting season.

Selecting a period during the latter part of January 1935 (the week starting January 21), the entire field force of the Survey was assigned to a check-up of the population on the winter feeding and concentration areas. About 300 operatives were available. Unfortunately, this number was totally inadequate to assure complete coverage and it became necessary for the eight regional directors who supervised the work to make allowances for areas for which no personnel could be assigned. Because of their long familiarity with their respective regions, it is believed that these directors were fully qualified to make these corrections. The instructions issued to each observer specified the precise method to be employed in making the estimates and as a result of this check-up, the number of ducks in the United States during the winter of 1934–35 was estimated at 17,000,000.

The field party operating in Mexico during this season and which covered the many lakes of the interior, and the coastal lagoons of both coasts south to Yucatan and the Guatemalan border estimated another 10,000,000 birds spending the winter south of the Rio Grande.

Accordingly, it appeared that the capital stock of North American waterfowl at the opening of the 1935 nesting season was somewhere around 27,000,000. Admittedly, this figure cannot be considered as being any more than what it is, namely, an estimate, but it is an estimate that is based upon the carefully planned work of the best corps of observers in the country.

From the sales of duck stamps we have a fairly accurate check on the number of duck hunters during each season, while from a large series of observations and reports, it is possible to determine the probable average season bag per hunter. Translated into ducks, these figures yielded an estimate of 6,000,000 birds taken by the hunters of the United States. This includes the losses due to crippling which, from the field studies of Errington and others, we

now know is very heavy. Another 6,000,000 loss is charged to illegal hunting, disease, predators, and other natural and unnatural causes. Possibly this figure, equaling the legal kill by sportsmen, is too high. It is hoped that it is, but the total loss from night shooting, illegal trapping, and other market hunting, and disease is very heavy, strive though we will to reduce it. An estimate also must be made for the loss from all causes in both Canada and Mexico. Reliable figures are not available from either country, but the evidence of our own field parties has disclosed the fact that very few Mexicans are duck hunters, most of the duck shooting in that country being done by foreigners (nationality best left unmentioned) who go to Mexico to shoot without the necessity of paying attention to conservation regulations. If 5,000,000 birds are allowed as the total loss chargeable against both countries, it is believed that it is a liberal figure.

Accordingly, working backward as it were, we arrive at a preshooting season estimate of 44,000,000 for the game waterfowl of the North American continent. "A rank guess", someone says. It may be somewhat of a guess but it is hardly rank, and thus far no one has succeeded in advancing evidence to prove that it is very wide of the mark.

In attempting a practical interpretation of these figures, it is at once apparent that a total estimated loss of 17,000,000, nearly 40 percent of the preshooting season population, is too much of a drain upon our capital stock. Regulations for the present shooting season were deliberately drawn to reduce the one immediately controllable factor, namely, the legal kill by sportsmen, in the hope that next spring we can send the breeders back to Canada with a few million increase in their numbers. We hear lots of loud talk about the control of crows, gulls, loons, cormorants, snapping turtles, and other forms of life that at one time or another can be, and sometimes are, destructive to a local waterfowl population, and we are urged to restore breeding grounds (which we are doing as rapidly as possible), better enforcement and other laudable cure-alls, but the simple fact remains that in an emergency such as has confronted us during the past few years the control of the legal kill of honest sportsmen is the only action that can be taken to assure immediate results.

With this background we can now return to the investigations made last summer on the breeding grounds. For obvious reasons, special attention was given to Canada, the nursery for the majority of our ducks and geese. Five parties took the field early in June, each one led by an experienced biologist or game management agent. In every case save one, these leaders had covered in 1934 most or all of the territory assigned to them and so were in a position to make direct comparisons.

In British Columbia the party, led by Biologist O. J. Murie, worked north through the valley of the Fraser River to the Stuart Lake area in the central part of this Province, covering multitudes of marshes, ponds, and larger lakes in the vicinity of Williams Lake, Prince George, and the Chilcotin country. This region has suffered but little from drought conditions or the demands of agriculture and the investigators found that the number of ducks observed seemed to indicate a gain over 1934. The report of the survey party

was supplemented by one from Maj. Allan Brooks, of Okanagan Landing, B. C.

Unfortunately for the sportsmen of the United States, other than those in the extreme Northwest, banding data have demonstrated that very few ducks from British Columbia migrate south of Puget Sound, which is the chief wintering ground for these birds. The origin of the large offshore flights of pintails that follow down the Pacific coast is not now known, but it is surmised that this is an Alaskan contingent, probably from the breeding grounds of the Yukon and Kuskowim Rivers.

The second party, under the leadership of Biologist Luther J. Goldman, traveled north through Alberta to Fort Chipewyan, on Lake Athabaska, and spent much time investigating the vast breeding grounds in the delta of the Athabaska River and surrounding country. They also extended their researches on northward into Mackenzie to Great Slave Lake. The country traversed is in the heart of the greatest of all North American waterfowl breeding grounds, and it was gratifying to have the report that it was supporting a somewhat larger duck population than it did in 1934. At best, however, the country was occupied by only a fraction of the number it could support and actually did support 20 years ago.

In southern Alberta and Saskatchewan, a party led by United States Game Management Agent W. H. Ransom made a thorough coverage, their investigations extending northward in Alberta nearly to the Athabaska River, and in Saskatchewan to Prince Albert. This is probably the most important of all Canadian agricultural regions, and much of the former waterfowl breeding grounds have been permanently destroyed and their places taken by fields of grain. The remaining areas still available to the birds are subject to further destruction by pasturage and the cutting of hay, while the effects of the great drought are still apparent despite the copious rainfall of the past summer. On some areas the operatives recorded a heavier duck population than was observed in 1934, while on others the number of birds was distinctly less. In adding up their sources for these lakes and marshes, they found that the increases did not by any means offset the decreases. A total of 114 broods of young were studied, averaging 6.3 ducklings per brood, which was evidence of an exceptionally good hatch, and it further appeared that the number of young to survive the many hazards of fledgling life was unusually large. In summing up the situation in this region, the observers concluded that it was unlikely to produce any substantial increase over 1934 in its crop of waterfowl, but should contribute about the same number.

Biologist C. M. Aldous led the party assigned to Manitoba and southeastern Saskatchewan and which worked extensively in the region of lakes Manitoba and Winnipegosis, including the justly famed Nettley and Raeburn Marshes. They extended their investigations north to Swan River, the Pas, Cormorant Lake, and Moose Lake, in Manitoba, when, turning southwest, they proceeded across the Duck Mountains (said to have more than 1,000 small lakes and ponds), into Saskatchewan, where they covered the Quill Lakes, Johnstons Lake, the region around Regina, and the Qu Appelle Lakes. The breeding grounds around the larger lakes in Manitoba

suffered severely during the nesting season from terrific wind, rain, and snow storms from the north which swept the lake waters over the marshes to unprecedented depths, and destroyed countless nests. In late May a disastrous fire north and west of the Pas burned over 12 townships to utterly ruin one of the best breeding grounds in the Province. After the fire, burned duck nests were found in some places at 10-foot intervals. The marshes of Lake Manitoba did, however, produce a somewhat larger supply of birds than in 1934. This also was true of the Swan River country, and of some of the lakes in southeastern Saskatchewan. To summarize the data obtained by this party, it appeared that while the outlook at the first of the season was for a material increase, sufficient damage had been done to bring the status of the ducks down almost to the 1934 level, leaving, however, a slight but, nevertheless, material gain.

Investigation of the breeding black-duck population of the Maritime Provinces had not heretofore been considered necessary because this species had shown marked ability to take care of itself, even to outwitting the wiles of the gunner. The severe winters of 1933–34 and 1934–35, however, raised havoc with the birds of this fly way, and in some areas it appeared that the loss might be as much as 75 percent, the black duck being the principal sufferer. Accordingly, a party led by Biologist Neil Hotchkiss was dispatched to investigate conditions first in the State of Maine, and then in the Provinces of Nova Scotia and New Brunswick.

Bearing in mind the fact that the work was a first survey of these regions for this purpose and that there did not exist any comparable data from previous seasons, it nevertheless seemed obvious that both in Maine and Nova Scotia black ducks had been greatly reduced within the last 3 to 5 years. In Nova Scotia, however, all reports obtained indicated a slight improvement over 1934, when drought conditions prevailed over much of the Province. In the St. John River Valley of New Brunswick, along the coast of the Province and in an area on the New Brunswick-Nova Scotia line, conditions were much better, and the duck population could almost be considered satisfactory. These were, however, the only areas in this great country where the investigators found any number of birds at all.

Wildlife technicians, refuge and camp superintendents, and other field personnel of the Survey made careful reports on the local populations at various points across the United States. The great improvement in water conditions was, of course, a most important factor which found a quick response in the ducks. From Washington and Oregon, across the country to New York and New Jersey, ducks nested in areas that had not for years heard the quack of a duck in summer. The Bear River Refuge at Great Salt Lake, Utah, supported a larger breeding population of ducks than at any time since this project was completed some 3 years ago. Incidentally, the records of this refuge graphically illustrate just what can be done on an area when there are trained personnel awake to their responsibilities. Under the direction of Superintendent Mushbach, a weekly check-up or estimate by species is maintained throughout the year. Such a record is invaluable in showing the trend of the breeding population and of the migrants that use the area. For example, it was the speaker's privilege to do considerable field work in these marshes during the summer

of 1926, at which time the redhead was the dominant species. Upon revisiting the region in September 1935 it was surprising to note a decided scarcity of redheads, with a corresponding increase of pintails. Reference to the superintendent's weekly figures shows that this process has been continuous for several years, a steady reduction in the number of redheads and a continued increase in the number of pintails.

Many more examples might be cited, but it is believed that enough has been said to illustrate the possibilities of obtaining waterfowl population data that are sufficiently reliable for practical purposes.

There is one more matter in connection with these population studies that may some time have tremendous import, namely, the flyways. It has been clearly demonstrated that the ducks and geese of the four major flyways constitute more or less homogeneous groups, even though they may be made up of virtually the same collection of species which may, in turn, share a common breeding ground. Such being the case, it becomes apparent that overshooting in one or more flyways while migration is in progress or the birds are on their wintering grounds, can so reduce them that nothing short of complete protection will prevent extermination; and this, even though in adjoining flyways the same species may exist in such numbers as to warrant the granting of liberal shooting privileges. At the present time the ducks of both the Atlantic and the Pacific flyways are in far worse condition than are those of the Central and Mississippi flyways.

The case of the Pacific flyway demands particular attention, as there can be no question but that the birds of this major unit have been seriously overshot for several years. The Atlantic flyway is complicated by the two flights of black ducks, of which the northeastern or New England is in very bad shape, while the interior flight is in much better condition. Most of the diving ducks of this flyway also are in greatly reduced numbers, although this year the canvasback is indicating a healthy increase over last year.

During January 24, 25, and 26 of this year the midwinter inventory was again taken in the concentration areas where a greatly augmented personnel, aided not only by the regular patrol boats of the Survey, but also by craft of State conservation departments, the Bureau of Navigation and Steamboat Inspection, and the Coast Guard, as well as by seaplanes from the Navy and the Coast Guard, some land planes and a dirigible of the Army, and the Goodyear blimp *Enterprise*, were available to attempt an estimate of the ducks and geese surviving the shooting season. Another field party also has been dispatched into Mexico. In some cases the regional directors had 500 to 600 observers and it is believed that a fairly complete coverage was made except in the three Northern States of region 7, North Carolina, Virginia, and Maryland. In this district some 30 to 40 power boats were standing by ready to go, while from the naval air stations at Annapolis and Norfolk, 13 seaplanes were available, and the blimp *Enterprise* was ready to cover the Potomac River from Washington to Point Lookout. Travel instructions had been issued for practically every biologist and agent attached to the Washington office, when "the plans of mice and men" were completely disrupted by the uninvited entrance into the picture of Jack Frost. The current cold spell struck 2 days before operations were

scheduled to start and by January 24, all boats were solidly frozen in and there was no open water from which seaplanes could take off. Telegrams and long-distance calls reset the date to January 28, but still Fate held out against us. The freeze-up has, of course, driven out the ducks from this district and they may show up in the reports from other areas. Reports are just beginning to come in and it would be most premature for me to include them in this report. I may say, however, that while in some sections there is reason for satisfaction, in others, the picture remains far from bright. A report will be prepared and released as soon as possible.

And now, in conclusion, I desire to acquaint you with the method used to estimate waterfowl concentrations, and which is the one used this season by all observers reporting for the Survey. Briefly, it simply calls for estimating the square yards covered by the raft: allow one duck per square yard, and subtract one-third to allow for raft-end taperings and open spaces within the formation. Use of this method is, of course, absolutely dependent upon the ability of the observer to estimate distances on the water—admittedly a very difficult matter. I do not hold any brief for the method and admit that for some species, as redheads, it is difficult to apply. It was originally worked out by me in 1922 after studies on Crane Lake in the valley of the Illinois River. It has since been tested to some extent by aerial photography with mapping cameras on canvasbacks and mallards. To me the results have been most gratifying and have convinced me that for practical purposes it is the best method that has yet been proposed. Shoot it full of holes if you can. I'll welcome any and all constructive criticisms.

(No discussion.)

Waterfowl Conditions in Canada, 1935

(By Hoyes Lloyd, supervisor of wildlife protection, national parks of Canada, Department of the Interior)

BREEDING CONDITIONS

Generally speaking, waterfowl breeding conditions throughout Canada in 1935 were better than they were during the previous 6 years. The improvement in the West is the result of greater precipitation, and in the East to a recovery of the black duck from a serious set-back of 2 years ago.

From British Columbia, the waterfowl observers who cooperate with the National Parks Service of the Department of the Interior, Ottawa, reported waterfowl breeding conditions good.

In that portion of the Canadian duck-nesting area, situated in the southern part of the Prairie Provinces, Alberta, Saskatchewan, and Manitoba, water conditions were much improved over those of the past few years. The chart gives a general idea of the precipitation in that part of the duck breeding grounds as determined by averaging the annual records of the official weather stations for the years 1928 to 1935. (Location of these stations was shown at the American Game Conference, held in New York, January 1935.) The black in the clumn indicates precipitation up to the end of July

234219

A, Three adult wild geese feeding near Dog Lake, Oreg. (Forest Service photo.)

173324

B, Pelicans on Bird Island in Great Salt Lake, Utah. (Forest Service photo.)

B37047

A, Antelope watering at Hobble Springs, Charles Sheldon Antelope Refuge, Nev. (Biological Survey photo.)

B27189

B, Buffalo in feeding corral in National Bison Range, Mont. (Biological Survey photo.)

in each year, when water is so essential to the raising of young ducks.

In the wooded area lying to the north of the prairie duck breeding grounds in Alberta and Saskatchewan, water conditions continued approximately normal during 1935. That area did not suffer to any great extent from the last drought. It was reported that Lesser Slave Lake, in central Alberta, reached the highest point in 40 years.

To the north of the prairie section of Manitoba, conditions were mostly favorable during 1935, except that in the vast breeding grounds around The Pas, Manitoba, low water and fires in the marshes seriously affected the 1935 duck crop.

Much of the northern part of Manitoba and Saskatchewan, and a small part of northeastern Alberta, fall within the Archaean formation which, while very well watered, is generally unsuitable for waterfowl.

In the Canadian nesting range of the black duck, which extends eastward from Manitoba, across Ontario, the southern part of Quebec, and the Maritime Provinces, conditions during the 1935 waterfowl breeding season were satisfactory. In the Maritime Provinces there was an improvement over the 1934 season when there was a decrease of from 40 to 60 percent in the normal supply of black ducks.

FALL MIGRATION

The 1935 fall migration of waterfowl from western Canada was 3 or 4 weeks earlier than the 1934 migration. Last fall winter conditions came suddenly during the last few days of October, which had the effect of hastening the birds on their way to the wintering grounds. It was reported that on October 28 and 29, large flocks of waterfowl were moving southward. The sudden lowering of temperature resulted in the hurried and concentrated migration which gave the impression that an unusually large number of ducks had been raised in the northern part of the breeding area.

Concerning the fall migration in eastern Canada, there was no outstanding feature. Mild weather prevailed throughout the duck-hunting season, and while reports from some sections indicated plenty of birds, comparatively few were taken.

In the Maritime Provinces eel-grass conditions showed no improvement. Consequently there was very little goose and brant shooting there during the 1935 fall migration.

WILD GEESE

It must be the case pretty generally throughout Canada that the hunting of wild geese of the several species which migrate across the settled portion of the country is mostly a thing of the past. As breeding birds, Canada geese have practically disappeared from the settled parts of Canada. Unlike the more southerly portions of Canada, the Arctic and sub-Arctic regions still afford a nesting area for many kinds of geese, and there has been perhaps no great change in their condition in recent years save for the serious depletion of both the geese and brant of the Maritime Provinces of Canada.

SUMMARY

Good breeding conditions on the Canadian breeding grounds will not provide a waterfowl supply for the continent. The southern prairie section of the Canadian west has diminished in importance because of invasion of agriculture and because of other interfering factors, and will probably never again hold the place it once held. Between this agricultural prairie belt and the Archaean to the north and northeast, lies a fringe of waterfowl breeding territory of importance as a breeding ground for many species of waterfowl, and always well watered. We hope that breeding stock to keep this good waterfowl breeding area working at capacity will be supplied from the south each spring.

It is just a question whether this area is working at capacity now. The demand will always be as great or greater than the possible supply, and so the utmost caution in safeguarding this wild livestock must always be exercised.

DISCUSSSION

In his concluding remarks Mr. Lloyd said the black duck seemed to be increasing in Canada. He said the water conditions were much improved in the last 2 years, and that there was very little duck shooting during 1935.

Mr. D. C. Hylner asked Mr. Lloyd if it were a fact that the majority of the Provinces in Canada have seasons of from 2 to 3 months and bag limits of 25 ducks. Mr. Lloyd said some of the Provinces may have stuck to the number of days under the treaty. The winters determine the season and not the law. They may say 2 months on their statute books, but the winter would not permit 2 months. The treaty sets the maximum season and the Provinces may cut down to a shorter time.

The Wild-Duck Factory Needs Repairs

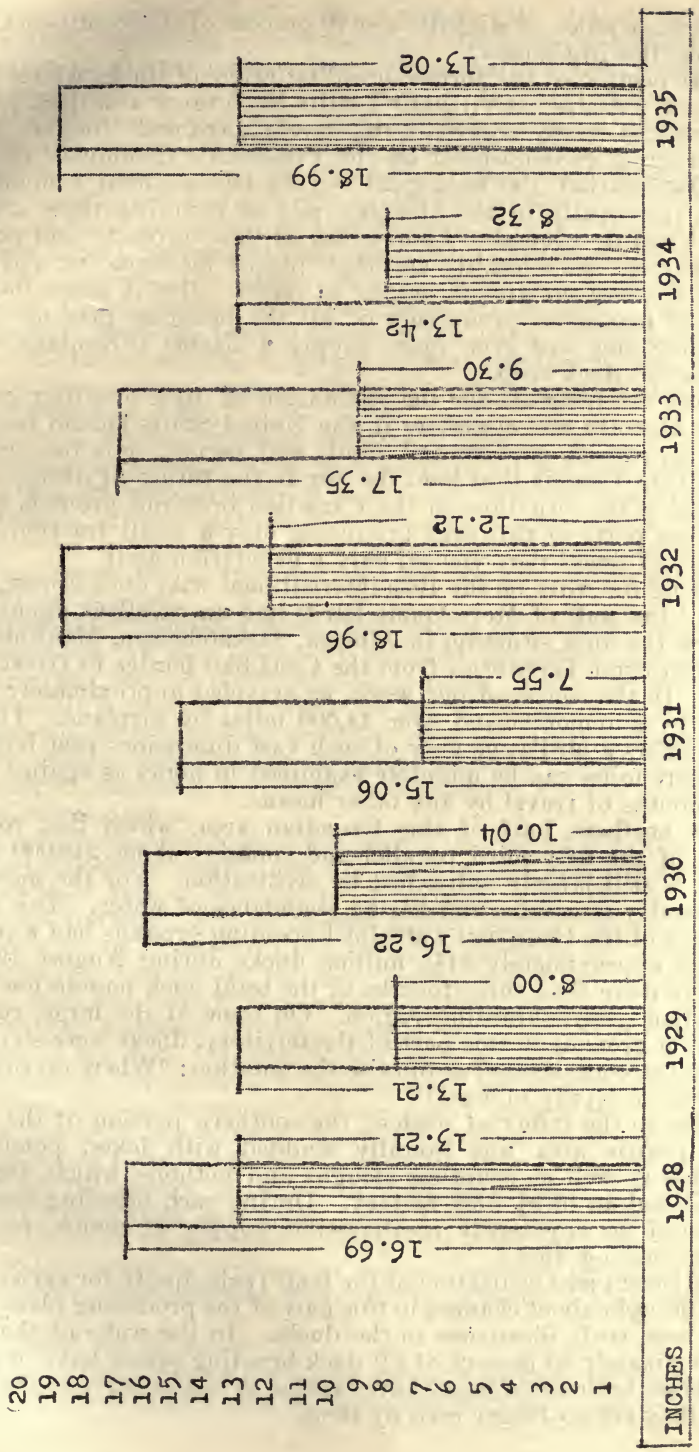
By John C. Huntington, vice president, More Game Birds in America, Inc.

Ever since a serious shortage of wild ducks has made itself felt on the North American Continent, numerous efforts have been made to halt the downward trend in our duck supply. Most such efforts have taken the form of restrictions on the shooting of ducks.

Sound administration of our waterfowl resources requires that the annual losses from all causes, including shooting, be kept well within the annual production so that we may have a continuing increase in the number of ducks which go north to breed each spring.

We must recognize, however, that all the regulations in the world cannot restore duck breeding grounds. It is on the restoration of the former nesting areas which have been ruined that the future duck supply depends.

An overwhelming percentage of the annual continental duck crop has probably always been produced in the vast prairie region, which includes the Dakotas and parts of the bordering States, a portion of Manitoba, most of Saskatchewan and Alberta, and extends in the Northwest Territories to Great Slave Lake. This area of about 630,000 square miles is the main source of supply of ducks for practically all parts of the United States. Four hundred and fifty thou-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sand square miles, or slightly over 70 percent of this continental duck factory, lies in Canada.

That portion of the former breeding range of ducks which lies in the United States has virtually lost its importance as a duck-producing area due chiefly to agricultural development and drought. Under the program recommended by the President's Committee on Wild Life Restoration, the Biological Survey has acquired a number of areas, principally in the Dakotas, and is restoring these areas as duck breeding grounds. Completion of these projects, and possibly others in the same locality and their proper management will materially increase the annual output of ducks. But it seems doubtful whether maximum production of all the breeding grounds in the United States will ever again supply a sizable percentage of the continental duck crop.

While the program for the restoration of duck breeding grounds in the Dakotas and elsewhere in the United States should be prosecuted as rapidly as time and funds will permit, it is the breeding grounds of Canada that hold the key to the future of ducks.

What is the situation on the Canadian breeding grounds today? Why are parts of this area producing only a small fraction of the number of ducks they yielded only a generation ago?

During the work on the 1935 international wild duck census, members of the staff of More Game Birds had an excellent opportunity to view the duck situation in Alberta, Saskatchewan, Manitoba, and the Northwest Territories from the Canadian border to Great Slave Lake. In the course of our work, we traveled approximately 30,000 miles by automobile and over 14,000 miles by airplane. The airplane offers a bird's eye view of such vast dimensions that hundreds of square miles can be minutely examined in hours as against weeks and months of travel by any other means.

The northern half of this Canadian area, which lies, roughly, north of the fifty-third parallel and contains about 240,000 square miles, is still largely untouched by civilization. For the most part the country is wooded and has an abundance of water. This northern half of the Canadian waterfowl-breeding grounds had a population of approximately 31½ million ducks during August 1935, or slightly more than three-fourths of the total duck population of the Canadian prairie-breeding region. On some of the large, compact breeding grounds in this part of the territory, ducks were so numerous and so concentrated as to raise the question: "Where do they find a sufficient supply of food?"

Prior to the influx of settlers, the southern portion of the Canadian prairie area was literally studded with lakes, ponds, and marshes as well as countless sloughs and potholes which, together, constituted an ideal duck factory. During each breeding season, it produced an apparently inexhaustible supply of many species of prairie-nesting ducks.

Settlement and utilization of the land (principally for agriculture) have brought about changes in this part of the producing plant which have been truly disastrous to the ducks. In the wake of the plow, approximately 80 percent of all duck-breeding places have dried up. Of those that remain many have become so unattractive to the ducks that they are no longer used by them.

During the summer of 1935 the southern half of the Canadian-prairie area, containing approximately 210,000 square miles, had a population of approximately five and one-half million ducks, less than one-seventh of the total population of the whole area. Those figures, thirty-one and one half million ducks, in 240,000 square miles, and five and one-half million ducks in 210,000 square miles, prove that our western-nesting ducks—the bulk of the present international supply—are literally being driven to the wall by the inroads of civilization on their ancestral breeding grounds. Year after year they have been forced farther and farther north up against two impassable ecological barriers—the Rocky Mountains on the West and that great rock formation, the Canadian Shield, on the east. These natural barriers converge toward Great Slave Lake, which forms the apex of the last remaining unspoiled natural breeding ground of the entire prairie nesting region. Here the prairie-nesting ducks are making their last stand.

With those figures before us, we do not have to be expert mathematicians to understand, first, that we have all too few eggs, and, second, that entirely too many of them are in the same comparatively small basket. If some natural calamity, such as an epidemic disease, should occur on this northern portion of the territory during the breeding season, the curtain will be rung down on ducks for many years, if not forever.

Viewing the Canadian prairie duck region as a whole, and using business terms, we may truthfully say that the producing plant is still there, but half of it is virtually in ruins. Until the unspoiled northern half is made safe against the fate which befell the southern half, and the damage at least partially repaired in the southern portion, we simply cannot expect any great increase in our continental duck supply, irrespective of what takes place in the less important duck-producing areas.

All too long we have collectively played the role of Micawber hoping that something would turn up which would again restore our ducks to their former abundance. It is high time that we realize that unless and until some competent agency does a businesslike job of restoration on Canadian duck breeding grounds, no substantial and permanent increase in the continental duck supply can be expected. Man has ruined the most productive portion of the natural duck breeding territory on the continent until Nature is powerless to restore it unaided. A cycle of abundant rainfall would improve duck conditions temporarily by filling dried-up potholes and ponds but, at best, the results would be meager and temporary.

Those sincerely interested in waterfowl restoration are faced with two questions: First, what can be done? And, second, who shall do it? On the answer to these two questions depends not only the future of wildfowling as a sport in the United States, but the very existence of some of our most valuable species of wild ducks.

I have been asked to give our answer to these two questions based on our rather comprehensive study of the situation during the past 3 years.

First, what can be done?

Obviously, the preservation of the more important duck breeding grounds in the northern area is of vital importance. All the duck-

shooting restrictions the United States could ever make will not halt the destruction of wild-duck habitats by the advance of civilization. We might stop all shooting and still witness the disappearance of our ducks. Such areas should be protected against the fate which befell the former preferred duck breeding grounds farther south. Competent management of these areas would insure a continuance of their present high rate of productivity. Practically all of the land in the northern area is Government-owned and Canadian officials concerned are willing to cooperate by setting such areas aside as permanent sanctuaries providing the necessary cooperation on the balance of the program is forthcoming from the United States.

In the southern half of the Canadian prairie breeding territory, lying generally south of the fifty-third parallel, there are many areas which formerly produced excellent crops of ducks, but which are now devoted to other purposes. Many of these areas are not particularly valuable for their present use and these should be acquired and restored as duck breeding grounds. An ample and permanent supply of water is of vital importance and this would necessitate the building of dams, dikes, ditches, storage reservoirs, and other water-control work which will insure the usefulness of the restored areas even during periods of severe drought. Each one of these producing areas should be placed under competent management. Unless such areas are properly supervised, protected, and developed by trained men, they cannot be expected to produce satisfactory duck crops.

In addition to water, wild ducks need an abundant food supply and nesting cover on their breeding grounds. Under proper management, these necessities could be built up and maintained.

Nesting wild ducks are particularly vulnerable to natural enemies. Predators such as crows, snapping turtles, and coyotes destroy tremendous numbers of the eggs and young of wild ducks which otherwise would reach maturity. Adequate protection against natural enemies on the restored breeding grounds is an important part of the work involved.

In restoring former duck breeding grounds and placing them under efficient management, other losses which seriously reduce the annual crop will be eliminated or at least substantially reduced. I refer to such things as the trampling of eggs by grazing cattle and horses, the destruction of nests and breeding birds by fire, and the loss of a tremendous number of birds by disease on contaminated areas.

If the work which I have just briefly outlined is done promptly and well, the southern portion of the Canadian prairie region will again become the most important duck-producing area on the continent. Its present annual production of about 5,000,000 ducks can be tripled, quadrupled, in fact increased almost without limit if funds are made available for the work.

A preliminary study indicates that with a fund of $500,000 annually much of the necessary work could be accomplished within a period of 5 years.

This brings us to the second question: Who can do this work?

Certainly the United States Government cannot do it for the good and sufficient reason that Federal funds are not available for expenditure in Canada or any other foreign country for such a purpose. The Canadian Government has fulfilled its obligations under

the Migratory Bird Treaty Act in very fine shape. They could, of course, and probably would be willing to do the work, but the necessary money is not available and there is no earthly reason why Canada should provide it.

That, it seems to me, puts the problem squarely up to those who reap the benefits from the wild duck crop produced in Canada—sportsmen in the United States and those industries which profit from the sport of duck shooting in this country. To them the restoration of Canadian duck breeding grounds is of truly vital importance. On the proper development and management of this area depends the continuance and improvement of the sport of wildfowling, which in turn directly affects the numerous business enterprises patronized by duck shooters which furnish them with equipment, transportation, and other needs.

There is every evidence that a duck-restoration project such as I have briefly outlined would receive the whole-hearted cooperation of the people of Canada, including high Government officials.

It is squarely up to the duck shooters of the United States and the industries profiting from the continuance and expansion of the sport of wildfowling to take the initiative and to decide promptly whether or not this necessary job should be thoroughly done, now before it is too late.

The Fundamentals of the Duck Situation, 1936

(By P. A. Taverner, National Museum of Canada, Ottawa)

Millions of words have been written and spoken on the cause of the present duck situation and proposals for its cure. With all this verbiage, wise or otherwise, relevant or irrelevant, sincere or specially pled, we are likely to have our attention diverted from the main issue and dissipate our energies along the trail of the proverbial red herring.

Ducks have been steadily decreasing from their original abundance ever since the white man came to the country. The progress has been consistently downward at a steadily increasing ration as the physical conditions of the land have changed, hunting methods became more efficient and the number of hunters increased with population. The recent catastrophic climatic conditions have not originated the downward movement but have only accelerated one under way. The causes that gradually depleted numbers in pre-drouth days will be in effect after they are over with the difference that the species will be even less able to stand them. If these birds could not stand the gaff in the past, they will not be able to do so in the future.

There are many contributing causes to this decline in duck numbers, but all boil down to the one fact—mortality has been greater than reproduction, the kill has been more than the stock could replace. There can be only two correctives—increasing production or decreasing mortality.

Conceivably, by intelligent management, reproduction of ducks can be increased in some unknown degree, but practically the methods of doing so as yet are academic and experimental. Successful technique has yet to be demonstrated and will take more time to develop and produce results than can be spared. The necessity is

immediate and time is an important element in the case. At best, management of ducks can compensate for only a fraction of the losses that have been sustained. Inevitably under the most favorable conditions possible we will have to be satisfied with much fewer ducks in the future than we have been accustomed to in the past.

The agents of mortality are many and various, some direct, others indirect, but the only one we have under immediate, positive control, is the human kill. It is also one of the most, if not the most important agent of destruction. When one State can roll up a record of 2,000,000 birds killed by sportsmen in a comparatively recent season, most other agents look unimportant in comparison. To concentrate upon minor losses to the neglect or exclusion of greatly major ones is a waste of time, energy, and an invitation to disappointment. It is absurd to fiddle with the little leaks in the barrel unless the big hole in the bottom is stopped tight.

It has been said that human restriction has been tried and failed. The truth is that adequate restriction has never been fairly tried. Restrictions have been progressively tightened through the years but have always lagged behind the need. Measures that would have been effective today have been postponed to tomorrow and those of yesterday instituted in their stead. The kill has always been greater than production and the decrease of stock has never been even temporarily stayed. We have never been even temporarily stayed. We have never cut our goods to fit our pattern. Unless we do so the end of the ducks and of duck shooting is in sight. The kill must be brought within production.

It does not matter how many individual ducks there are on the continent, whether fourty-two or a hundred million. Whatever the number is, we known by experience that it is too few for the number of sportsmen engaged in their pusuit. Numeration has given us impressive figures to roll under the tongue and side issues to argue over but has not altered the basic fact of an insufficiency of ducks. From the survey of More Game Birds in America Foundation it can be estimated that about one-third of the total duck producing resources of the continental interior has been permanently lost through the settlement of the prairie sections. This can never be more than fractionally compensated for by any management unless the kill is sensibly reduced from what it has been in the immediate past.

The one hopeful prospect is that there are still considerable areas in which there is no present probability of man intruding his destructive works, where ducks can breed unmolested for years to come. These areas, smaller than some hoped for, larger than many feared, are strictly limited by unalterable conditions. If its stock is not over-exploited it can produce a certain definite amount of duck shooting for the continent indefinitely, but we must confine ourselves to this limit and not overpass it.

However we are faced with a very serious dilemma. As shooting satisfactions increase, so do shooters. It is the vicious circle. We may build up certain game resources to a point where a hundred guns can be profitably and safely employed only to have 150 guns automatically produced to overshoot the supply. However many ducks we may have there will always be more guns for service than the stock will stand. It matters little whether 100 ducks are killed by 1 gun or 4 or 10; it is the total number of birds killed that is

important. Guns will always tend to increase to and beyond the safe limit of supply to the point where once more gunning becomes unprofitable. Unless bag limits and restrictions drastic enough to retire a considerable number of guns and to discourage the production of more can be instituted and enforced, the case seems hopeless. The only surety for the permanency of duck shooting seems to lie in the limitation of the number of guns in the field. How to do this I must leave to wiser heads, but, unpalatable as it is, it seems to be the only practical alternative to the end of ducking.

Wild Waterfowl Conditions in Manitoba

(By A. G. Cunningham, director, Game and Fisheries, Manitoba, Canada)

The principal breeding areas of sporting ducks in North America has long been recognized as embraced by the three Prairie Provinces of Canada—Manitoba, Saskatchewan, and Alberta. Under recent drought conditions, at least, Manitoba, with its enormous breeding marshes, probably takes first rank, closely followed by Alberta, then Saskatchewan. The latter, with the largest campestrian area, was exposed to the greatest ravages of the dry cycle. All three provinces, however, are endowed with breeding habitats capable of supporting a prolific abundance of waterfowl. The chief requirement is a safe and adequate supply of returning breeding stock to populate the existing areas.

Manitoba has long been recognized as lying within one of the major flyways of North American wildfowl. This is especially pronounced during the spring migrations. At this time ducks and geese appear in maximum abundance. For a period of 3 to 5 weeks it is estimated that successive flights of geese bring the migrating total to several millions. These are made up chiefly of Arctic breeding species such as the lesser snow, blue, and white-fronted geese, which have not suffered from the effects of drought on the breeding grounds. Canada geese are also plentiful, which nest in the provinces, as well as north to the Arctic tundras.

These great flights come to a temporary halt on resting and feeding grounds within a few miles of the city of Winnipeg. The birds are not molested and evidently are well aware of their security. This is a source of great attraction, particularly to city dwellers. Thousands of motorists visit these resting grounds while the geese loiter in the vicinity. While the geese in their nothern migration recognize this particular area as a place of refuge, they are apparently not of the same mind in the southern migration, for comparatively few direct their flight through Manitoba. At this season the number of geese shot in Manitoba apparently does not exceed 1,000. The flyways at this time are principally southward over Ontario and Quebec and the New England or middle States, and through Alberta and along the Pacific coast. Straggling flocks return over the Mississippi flyway.

Manitoba is one of the few provinces in Canada that requires the game-bird hunter to make a return at the end of the open season; this must show the number and kind of birds killed. Data from these returns, averaged over a period of years, indicate that about 135,000 ducks are taken. These include the river, pond, and

diving ducks, mergansers, coots, and scoters; also geese and snipe. Figures for the duck bag in Manitoba average only about 12 ducks to each licensed hunter.

Under stress of recent harmful conditions the mallard and pintail have best held their own and comprise the greater population of ducks in Manitoba. In some parts of the West, lesser scaup and American goldeneyes have also rather successfully resisted the otherwise general depletion. Those species hardest hit include blue—and green—winged teals, canvasback, gadwall, redhead, and ruddy duck. There appears to be reliable grounds for believing that some of these species achieved a measure of recovery under the beneficially greater precipitation which occurred during the past season. In Manitoba there is no lack of suitable breeding and feeding grounds for wild waterfowl. In fact, the great lake and interlake marshes are among the finest on the continent. These extend well northward to and beyond The Pas. Despite these unexcelled advantages, the failure of the duck crop in recent years has been very pronounced. That this should have fallen with such a heavy hand on the drought section of the prairie Provinces of Canada is really of greater and more significant concern to the United States than to Canada, as, though of only limited territorial effect here, it is felt in the United States from ocean to ocean with the possible exception of the extreme east.

Federal and provincial authorities, sportsmen, conservationists, and others are here most gravely concerned about this waterfowl depletion. After Nation-wide checking, Federal officials state that it is doubtful if the hunters can continue to draw upon the diminishing duck supply at anything like the present rate; unless conditions radically improve this would spell the gravest depletion for some species and almost certain extermination of others.

To the end of guarding waterfowl, it may be said in passing, that the use of live decoys, baited waters, and automatic shotguns have never been permitted in Manitoba. In this Province also there has been a steady reduction of bag limits, open seasons, etc., during the past 5 years. The bag limit has been reduced by 50 percent and the season has been materially shortened.

It is estimated that approximately 80 percent of the ducks shot in the United States are hatched in the three prairie Provinces. As waterfowl do not recognize any international boundary, it is necessary for the closest cooperation between the United States and Canada in an effort to restore and maintain ducks in that degree which will eliminate once and for all any danger of extermination.

(No discussion.)

GENERAL DISCUSSION

(Since so many papers had been read without any opportunity for discussion or comment, the chairman of the session suggested that the meeting be carried over into the afternoon. Dr. Pirnie appointed Mr. Sutton as temporary chairman of the afternoon session, which convened at 2 o'clock.)

Mr. Kalmbach, of the Biological Survey, opened a short discussion by remarking that the breeding population of ducks in 1934 in Saskatchewan and in 1935 in Alberta is extremely spotty. There are areas southeast of Edmonton well covered with nesting environ-

ment 3 or 4 miles in extent. At other points there are as high as 14 nests to an acre. Many acres which are wholly unpopulated are well suited for them.

Dr. Pirnie, in referring to Mr. Huntington's paper read at the morning session, said that we must take into consideration waterfowl behavior in interpreting what the men see in the field. He said that on an area of 80 acres we know fairly well what happens over a period of 5 years but he said the inventory man was up against a difficult proposition. He said it couldn't be covered in 1 week by the same man. In the spring we may find nests, which is the best proof of nesting. A drake and a duck doesn't prove nesting. During most of the year the birds are moving around and it is hard to say that so many ducks were at a given point at a given time.

Mr. Sutton remarked that the time to be sure of a census is to get it when the old ducks are with the young.

Mr. C. W. Baker of Massachusetts spoke of a census recently taken in Connecticut by four men. The newspapers reported that from Connecticut to Long Island that census showed 500,000 ducks in a certain area. He said he was talking with the regional warden and the report was denied. Mr. Baker said how are we going to arrive at a solution of this problem when they report 500,000 ducks when there are not actually 30,000. How are you going to arrive at an inventory?

Mr. Lincoln stated that in taking the midwinter inventory this year the Biological Survey, in order to obtain better coverage, is employing cooperation from other agencies. Heretofore only Bureau personnel has been used. The Survey is not yet informed concerning the report to which Mr. Baker referred and so it is not prepared to state which of the observations is most nearly correct. Some difficulty is anticipated since this year the picture is complicated by observers of unknown qualifications. Probably in another year it will be necessary to go back to Survey personnel only as it is obvious that the figures obtained by some untrained volunteer observers cannot be used.

Mr. Baker said from the figures taken from the Biological Survey migration report last year there was a tremendous increase in spring over fall. It was so noticeable he said, according to the Survey statistics, that it brought a question into his mind.

Mr. Lincoln. During the spring flight the birds are not scattered over so much country and it just happens that our observers are more concentrated in these flight lanes.

Mr. Baker. You went out of your way. The change in conditions has affected migratory birds.

Mr. Lincoln. This job of trying to get numerical estimates of our migratory waterfowl is, in some ways, almost an impossible task and sometimes I think that the trends shown in reports of increase and decrease are more useful. It should always be remembered that a waterfowl inventory or census can only be an estimate and there is danger in reports by untrained observers. Some inexperienced observers cannot see a large flock of ducks without thinking of "millions", while others have such a fear of exaggerating that they refuse to believe they actually see as many as their eyes tell them they do. For the benefit of this group, however, I may report that, generally speaking, our investigations over the entire country indicate that

there has been an increase over last season. Probably it is not large, but it is definitely an increase.

Mr. Pancoast of Salem, N. J., stated that from Arnold's Point to Fort Mott, N. J. is 18 miles, to a place called Elsonboro Point. He said in there was one of the best nesting grounds in the State of New Jersey. The land belongs to the Government and it is a tract consisting of from 500 to 2,000 acres. Here the tide is regulated by sluice gates, and the ducks congregate there in large numbers. He said the way to take a census was to pick out a reliable man and have him go to the same point, the same time every day.

Mr. Burlington, of New Jersey, referred to a tabulation in New Jersey of dead ducks which seems to be very accurate over a period of 10 years. He said if you would make a tabulation like that over the entire United States you could get an accurate idea of how many ducks there are. He said their estimate was made on a 3½ months' period and when they had the staggered system of 30 days they were only killing one-half the number of ducks. He said the system of having a staggered season of 3 or 4 days a week over a period of 13 weeks would be a good one.

One gentleman remarked that in Pennsylvania the record of the kill was kept on a coupon attached to the license and in that way the record of the kill was reported right away but in New Jersey they don't make their report until a year later. He thought it would help out a lot if they had a coupon on the license and reported the kill right away. The chairman said he thought this was a good idea and suggested that New Jersey step it up a little.

Mr. Baker asked how far south the Canada goose goes. Mr. Lincoln said it goes to Florida. Mr. Baker said he wanted to bring to his attention that Mr. Smith, of the Biological Survey, had told some sportsmen that it didn't go beyond Long Island.

Mr. Lincoln explained that the Atlantic flyway has two important flights of the Canada geese and it is true that all available evidence indicates that the New England one goes very little south of Long Island Sound; the geese on the South Atlantic coast come from breeding grounds in the interior and reach the coast in the general vicinity of Delaware and Cheasapeake Bays. The birds wintering in Florida are apparently from the Mississippi flyway.

Dr. Pirnie pointed out that the local kill of a gun club is only valuable up to a certain point or the total kill by States. The study of winter concentrations is the most important because they do not always come back to the same place. We do not understand behavior of waterfowl. The known kill can only be useful as a record of the kill. It is not as important as the census of live ducks in a given season.

Mr. Huntington said he wanted to clear up a misunderstanding that apparently existed in reference to the 1935 census in Canada. He said it was conducted by the foundation only for one reason—to make an effort which had not been made before, to see whether it was possible to get an accurate picture of how many there were during the breeding season. Mr. Huntington said that to them there was only one problem and that was accuracy in the count.

We are not anxious to show a few or a whole lot—we want to know how many. The counting of ducks is a big proposition. If you had seen how it was done in the agricultural belt, by farmers, sportsmen, Canadian mounted

police, and so forth—they were men who lived with the ducks. They were not trained counters but they had no problem in overestimating or underestimating. The unit used for inventory purposes in the agricultural belt was the rural municipality. The figures for the agricultural belt were based on a sound report. There were no guesses of thousands—some reported as low as 10. It showed where they were at the time. It was the compilation of those that gave us our figure. There was no means of transportation except water, and while you could not cover a territory of that size in a canoe the airplane gave us a good view of hundreds of square miles in a few hours. You could never get the same information by any other means of travel. Vegetation was no problem. No effort was made to get the species of ducks except where it is easy and positive. On the air work we only wanted number and distribution. Those figures represent a sincere and honest effort by people who have had some experience in the work. In the actual census work the planes flew as low as 40 feet. * * * The main method of counting is by linear mile, in groups of 50, 100, and 500. Where two observers differed we rechecked the figures. In the extreme northern area you have a different situation. You have water area to a very limited extent, and the vegetation is very scanty with trees growing in between—we found there was the greatest concentration of ducks, and we took a stretch of 400 square miles and it was covered in a very short time. Our estimate in those cases is based on the number of birds per acre and as before, if two observers differ a recheck was made. If any error was made it was on the side of conservatism. We saw most of the ducks because they were not hidden by vegetation but any error was on the right side.

Someone remarked that counts seem useless and that duck stamps would serve the purpose just as well.

Dr. Pirnie said (going back to Mr. Burlington's discussion in regard to counting dead ducks) he couldn't see the value from a statistical value by counting dead ducks. A summer census of breeding stock is of value because it gives us information we need for fixing the shooting season.

Mr. Lincoln said that he believed the duck situation had turned the corner.

Mr. Huntington said:

Our figure of 42,000,000 is accurate within a small percentage, I am confident, and we feel we will have more ducks going north to breed next spring.

Dr. Pirnie said:

I was interested in the write up on the report of your international duck census * * * I crossed Minnesota during the open season on ducks and just before the opening of the season. I read with interest your discussion referring to Minnesota. Minnesota is so much like Michigan. There are so many wild areas and a plane is hard to use. We have to rewrite all the reports of local observers. You ran into in Minnesota what we got into in Michigan—what ducks are breeding, what concentration. What exists there is much confusion in the common names of ducks. * * *

He said if you have located a new concentration of a certain species, it should be reported.

Mr. Huntington said they had run into the problem of local names for ducks, and he said they did the best they could in identifying them. One species had several local names. When they were found that way he said they threw them into the unidentified classification. He said their work attracted the interest of people in all parts of Canada, and they received cooperation from literally thousands of people who showed a good spirit and whom we didn't even know, and this interest was by people who lived with the ducks in the duck country, and it is what happens in that area that the future of the ducks in the United States depends. If we can get people interested, we think we have done a great deal. The ground reports

overlapped the reports from the air. We didn't discover it until we got back in New York. The results were astounding—the comparison between ground work and the air reports agreed to a remarkable degree.

Mr. Correll asked Mr. Lincoln if he thought the condition of the waterfowl was better on the Atlantic or Pacific coast.

Mr. Lincoln said that was a difficult question to answer. On the Pacific flyway they do not have the water areas where they congregate as they do on the Atlantic coast and where they are relatively safe. The large water areas and marshes in California have been eliminted by drainage. The ducks in many places are forced into small areas such as the little ponds maintained by pumping by the clubs; mostly at such points the ducks have water areas for only a small part of the time, as the pumping always stops when the shooting season closes.

Mr. Correll asked if the kill increased more rapidly in the Far West than in the East.

Mr. Lincoln said it did for awhile but during the last few years it has decreased. The condition along the Pacific flyway this year has improved and Mr. Lincoln said in direct answer to Mr. Correll's earlier question, conditions are more improved than along the Atlantic flyway.

Mr. Van Valkenburg, of Saskatchewan, addressed a few remarks to the session covering the conditions in Saskatchewan, and he said he felt very hopeful that this international cooperation between United States, Canada, and Mexico would greatly improve conditions and bring about a better understanding of the problems of all.

Mr. Cottam showed the slides which he had in connection with his morning talk. They were illustrations of plants suitable for waterfowl food, and the entire session took an intense interest in them. Mr. Cottam said that a bulletin would be published shortly describing the plants in detail and their habitat, and so forth.

The session adjourned at 5 o'clock.

POLLUTION

THURSDAY MORNING, *February 6, 1936.*

Chairman: SENATOR AUGUSTINE LONERGAN.

Committee: S. B. LOCKE, Izaak Walton League of America, Chicago, Ill.; M. M. ELLIS, Columbia, Mo.; GROVER C. LADNER, Assistant Attorney General, Philadelphia, Pa.; CLEM SHAVER, Reconstruction Finance Corporation, Washington, D. C.

SOME PROBLEMS OF STREAM-POLLUTION CONTROL

(By ABEL WOLMAN, chairman, Water Resources Committee of the National Resources Committee)

It is axiomatic in the development of any country that problems of water pollution become more acute as the country becomes more urbanized and industrialized. When Alexander Hamilton made his report on manufacturers in 1791 the water-pollution problem, as we know it today, had not aroused much interest, and when he obtained from the State of New Jersey the first industrial charter at Passaic Falls, almost a century and a half ago, no regulation in this charter referred in any fashion to the control or elimination of industrial wastes. Even at that time, however, an English observer traveling in this country referred to the highly objectionable character of the harbor of Philadelphia, then a city of only 60,000.

As in so many other directions rapid development of this country brought in its wake a series of difficulties most of which might have been anticipated by a more far-sighted citizenry. Today we are beginning to pay the penalty of this expansion in more dramatic form than might have been apparent a century ago.

It should not be forgotten, however, in assaying the cost of this penalty that great development of cities and of industries has accompanied the creation of these difficulties. The problem confronting all of us interested in the control of water pollution is not only that of correction, but of balancing the cost of that correction against the benefits to be derived therefrom.

Without attempting to discover the basis for the renewed interest in this problem, there is no escaping the fact that today more than ever in our history, individuals in every field of public and private activity have focused their attention on the problem of stream-pollution control. The sportsman, the industrialist, the sanitarian, are all concerned with correcting a situation which has become so complex in its technical and administrative features as almost to baffle any effort at control.

As a result of this great interest, the National Resources Committee in 1935 appointed a Special Advisory Committee on Water Pollution. This committee consisted of representatives of virtually all the major Federal agencies concerned with the problem and of State and local agencies whose administrative knowledge thereof was of long standing. The report of that committee has been referred to

from time to time in public discussions. It might be of value therefore to summarize briefly at this point its major findings, in order to predicate thereon some of the comments and conclusions here to be presented.

As was to be expected, the special advisory committee found a variety of State laws dealing with the control of water pollution. Some were good, some were bad, but accomplishment in the field of correction had little or no relationship to the existence of good or bad State laws. Those States which had had effective legislation on the books for over 20 years showed no better accomplishment than adjacent States with adequate legislation. The evidence appeared to indicate, as some of us had suspected for years, that law alone is not a corrective for water pollution.

It was found further that lack of administrative budget and personnel in State agencies likewise did not account for unsuccessful accomplishment.

Progress in the treatment of sewage was found to be unsatisfactorily slow. By and large, seven industrial States today account for more than half of the water-pollution problem of the entire United States. Of 68,000,000 people in urban centers of the United States directely connected with sewers, the sewage of over 40,000,000 obtains no treatment. The seven industrial States account for 25,000,000 of these people. In other words, concentrated effort within or upon seven industrial States of the entire country would eliminate more than half of the water-pollution problem.

The blanketing of the 48 States of the Union under a Federal law might appear to be unnecessary upon the basis of this fact alone.

In the field of industrial waste the situation may be assumed to be even worse, although the accumulation of accurate data in this field is almost impossible. Information as to the extent of industrial-waste treatment in the United States is almost wholly lacking.

That the problem of industrial waste is tremendous, however, is obvious to anyone even remotely familiar with this field. When it is remembered that on the Potomac River watershed two industrial plants discharge a total of industrial waste greater than the sewage flow from the entire city of Washington, some impression may be gained as to the character and volume of the difficulties involved.

Aside from the amount of industrial waste to be treated in the country at large, it should be remembered that for many of these materials no treatment process is available. In this respect the problem of industrial waste is even more acute and difficult of solution than in the domestic-sewage fields. In this latter field, at least, processes of treatment of every gradation are available for use, even though their costs are greater than most laymen suspect. Efforts to determine the total first cost of correcting the water-pollution difficulties of the country are fraught with danger. Some estimates have been issued from time to time by various agencies. one of them, so far quoted in public discussions, appear to fall within the realm of probable accuracy. The statement may be ventured that to correct the domestic sewage treatment problem alone would cost in the neighborhood of $1,000,000,000 for installation of plants. To estimate the cost of industrial-waste treatment at the moment involves even a greater hazard, but there is little doubt that it would

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A, Buffalo near watering place on National Bison Range, Mont. (Biological Survey photo.)

B43766

B, White buffalo in the herd on the National Bison Range. (Biological Survey photo.)

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A, Marten in the Wasatch National Forest, Utah. (Forest Service photo.)

255306

B. Otter asleep on ice in Salmon River, Salmon National Forest, Idaho. (Forest Service photo.)

require anywhere from two to ten times the figure for domestic sewage. Neither of these figures, no matter how inaccurate, include any annual operating costs, by no means an insignificant portion of the total financial load on the public.

These figures are presented here only to illustrate the size and character of the problem confronting the country. It may properly be asked, however, now that the facts have been made available, what shall be done about it? Proposals for correction fall automatically into two classes. The one may be summarized in the general motto "Pass a Federal law prohibiting the discharge of sewage or wastes into any stream." The other proposes the establishment of adequate river-conservancy agencies to cope with the problem.

Precedent for either of these efforts is lacking in the United States.

The probability of the first procedure bringing success is slight. In no country in which the history of stream-pollution legislation is available has blanket law been successful. Statutory formula has never produced satisfactory results in a field in which continuing administrative interpretation and regulation are prime necessities. The problem of water-pollution correction is a moving and variable one, differing in time and in place.

Many laymen frequently point to the experience of England as an example of success in water-pollution control. The facts, however, point to the contrary. Prohibition of discharge of sewage was the earliest expedient tried in England. It was a complete failure. This was later followed by the effort to impose a universal form of treatment on all discharges. For obvious technical reasons this likewise failed. The third step in England's effort to relieve the problem was to place river drainage areas under the control of continuing administrative bodies. The experience has been favorable, but none too rapid. The problem plagues them today.

Even in England, where State rights did not add an additional problem as in this country, the correction of water pollution has not proceeded with any too striking advantage. What little evidence may be gathered from the English experience points in the direction of avoidance of statutory blanket regulation. It retarded rather than hastened the elimination of domestic and industrial wastes.

When comparing the opportunity for the application of English practice to this country it must be remembered that two differences between the two countries and their problems are important. In this country we have the barriers of State political boundaries, and, secondly, the mere difference in size of problem. The Thames River Basin, for example, has an area of 7,200 square miles. It is one of the largest in England. The Ohio River Basin, the seat of one of the major water-pollution problems of the entire United States, has a drainage basin area of 204,000 square miles, approximately 30 times the size of the Thames Basin. The Ohio River Basin is larger than the combined territory of Italy, Austria, Hungary, and Belgium. When we talk blithely of operating the Ohio River drainage basin as a unit, we should bear this fact in mind before approaching the problem too hastily and with too much faith in simple legislative or statutory devices.

To maintain a stream in such condition as to provide suitable water for drinking, for the preservation of fish and wildlife, for

adequate agricultural uses, for industrial and recreational benefits, almost invariably gives rise to a series of competitive demands. It is extremely doubtful that all of these competitive demands may be simultaneously reconciled, to the advantage of all. In almost every instance a policy of give and take must prevail. Under the rigidity of statute the policy fails and with it the statute collapses.

Complete elimination of industrial discharge to save a few game fish may not be the height of desirable administrative control. On the other hand, indiscriminate discharge of industrial waste may not result in the most desirable use of a stream.

Even the administrative answer in some of these situations is a great deal simpler in theory than in practice. One of the problems confronting the speaker at this moment, for example, is to decide whether or not an industrial plant shall be permitted to be established in an area where industrial operations in the past have been virtually nonexistent. Such a plant would give employment to a minimum of 5,000 people, with a probable maximum of 10,000, in an area where relief costs have been great for the past 3 years and may continue to be so for many years in the future.

The industry in question is one which produces a considerable amount of waste for the treatment of which no known process is available. The development of the plant might result, and probably would, in the destruction of some fish at a loss to the surrounding community infinitesimal in proportion to the gain in employment of 5,000 to 10,000 persons.

Should the plant be prohibited and thousands of potential employees be deprived of making a living or should the stream be defiled to the disadvantage of some sportsmen and with considerable damage to beauty.

The case is not an isolated one nor a theoretical one. What should be the answer? Blanket prohibition does not take into account the equitable balancing of conveniences in a stream and therefore provides no answer to this question.

In those areas of the United States where industrial plants have been in operation for a great many years, interested individuals raise the serious question as to whether or not industrial and domestic waste treatment can be paid for by taxpayer or private owner.

In addition to the problem of balancing of uses of the stream for various purposes, the administrator has the additional task of reconciling such uses with other stream regimentation programs such as the control of floods, the provision for navigation, and the regulation of the stream for low flow.

In all of these efforts it is difficult to see how simple prohibition by statute can do anything more than fail.

An analysis of the water-pollution problem leads one to predict that the future will show increased emphasis on the search for administrative devices for control rather than for legislative expedients. This eventuality must result because the balancing of conveniences and the coordination of the uses will be the controlling guide. These functions are administrative ones. Recovery rather than the treatment of wastes will be the aim. Administrative flexibility in viewpoint and in execution rather than rigidity of enforce-

ment of law will be the incentive to the gradual elimination of stream-pollution problems.

Such a future program, of course, may be irksome to the impatient sportsman, but it is doubtful whether any simpler and more rapid approach can be taken in a field where technical and administrative complexity of correction is the characteristic and where the implement for most successful correction is money. Where both complexity of problem and heavy cost for correction control, progress may be slow. No basis in experience exists for the assumption that the mere passage of a Federal act or of any legislation, local or central, will accomplish any more with any greater speed.

The deficiencies which must be met are not in law, but in the absence of satisfactory interstate or regional river basin administrative units, of technical solutions of many baffling problems of industrial wastes and of money. The underlying elements required for the elimination of all of these defects appear to be time and, more important, a militant public conscience. Time may be shortened and public conscience aroused by a continuing Federal agency with powers of investigation and of stimulation of correction by grants-in-aid. As to administrative procedure, experimentation is required since experience is again lacking. It is for this reason that the subcommittee on pollution of the National Resources Committee recommended the initiation of an experimental administrative unit comprising the Potomac River drainage basin.

The Tri-State Antipollution Committee

(By C. A. Holmquist, Director, Division of Sanitation, New York State Department of Health [1])

Before describing the work of this committee, officially known as the Tri-State Treaty Commission, I shall review briefly the conditions leading up to its establishment.

Although the New York State Department of Health had long realized that it was imperative to protect our streams from pollution no definite action was taken by New York to control stream pollution until the so-called antipollution law was enacted in 1903. By that time nearly all of our large rivers and many of our small streams had become seriously polluted, only three relatively small municipalities having installed sewage-treatment plants. The New York law is similar to the antipollution laws of a number of other States, and in general prohibits the discharge of sewage and industrial wastes into any of the waters of the State in quantities injurious to public health without the approval of the State commissioner of health. However, municipalities and industrial plants which were discharging sewage and wastes prior to that time were exempted from the operation of the law.

The State department of health had many obstacles to overcome in its efforts to clean up our streams. Municipalities and industrial concerns had come to look upon the discharge of untreated sewage and wastes into streams as a vested right, and seemed to resent any interference with this practice. The constitutional limitations on

[1] Read before the North American Wildlife Conference at Washington, D. C., Thursday, Feb. 6. 1936.

the bonding power of municipalities and the high cost of the interception and treatment of sewage have been serious obstacles in our campaign against stream pollution. Experience in New York indicates that the cost of providing for the interception and treatment of sewage of municipalities varies from $5 to as high as $100 per capita, with an average figure of $25. On this basis it would cost about $1,000,000,000 to provide treatment for the raw sewage now discharged by over 40,000,000 people in the United States. The cost of such work for the city of New York alone is estimated at between $243,000,000 and $378,000,000, depending upon the degree of treatment provided.

Although municipal officials usually realize the necessity for providing sewage treatment, taxpayers are very often loath to vote favorably on propositions to bond municipalities for such projects. They feel that sewage treatment is primarily for the benefit of downstream communities and that neither they nor the community itself will receive any direct benefit therefrom.

Notwithstanding the fact that no municipality in New York has been allowed to install a new sewer system without also providing sewage-treatment works since the antipollution law was passed in 1903, and although some of our larger cities have installed such works to serve existing sewer systems, the sewage from a population considerably greater than the entire population of the State in 1903 is now being discharged without any treatment into the waters of the State. This condition has been due in a large measure to the phenomenal growth of some of our large cities, more particularly the city of New York, which today has a population almost as great as that of the entire State in 1900, and treats only a small percent of its sewage.

The industrial waste problem has also had a considerable bearing upon delaying progress in the clean-up of streams. In the field of sewage treatment, science has developed ways and means at a fairly moderate cost of treating sewage to such an extent that any degree of purity of effluent can be obtained. Years of study and vast sums spent in plant investments have made this possible. The industrial-waste problem, however, is much more complex and difficult to deal with, but there are encouraging signs that we are beginning to attack this problem along rational lines.

Whereas domestic sewage does not vary greatly the country over, we have nearly as many kinds of industrial wastes as we have industries; and some industries, such as the canning industry, produce many different types of wastes, all of which vary both in strength and composition. Some industrial wastes are often many hundred times stronger than sewage and others are so acid that they cannot be readily treated by biological methods and therefore do not lend themselves to treatment in plants suitable for the handling of domestic sewage without excessive cost. Consequently, until recently, very little progress had been made in the treatment of these wastes.

Certain State departments of health, however, have adopted a policy of cooperation with industry upon a State- and even Nation-wide basis in solving waste disposal problems. In a number of States, including Pennsylvania, New York, Wisconsin, Ohio, and Michigan, studies have been made in cooperation with industry in the treatment of wastes produced in leather, paper, pulp, strawboard,

milk, sugar, meat-packing establishments and other industries. The experimental work is usually carried on under the direction of the engineers and chemists of the State health departments and is financed largely or wholly by the State industrial associations and in some instances by national associations.

Inasmuch as the discharge into streams of cannery wastes constituted one of the most serious industrial waste-disposal problems in this State, our department has conducted experiments and made studies of the treatment of these wastes in cooperation with a large cannery and the New York State and National Canners Associations. These studies, which were carried out under our direction and supervision, were financed almost entirely by the canners and have resulted in solving this troublesome problem. We are now studying various methods of treating milk wastes.

The same spirit of cooperation has also extended to State health departments themselves, especially in the control of pollution of interstate streams. In 1925 an agreement was drawn up between the State departments of health of New York and Pennsylvania to aid each other in the control of the pollution of such streams. Although this agreement has no legal basis it has resulted in eliminating a number of serious sources of pollution in both States. In 1924 and 1926 agreements were drawn up between the departments of health of States located in the Ohio River Basin and a year later similar agreements were entered into by those bordering on the Great Lakes. The purpose of these agreements was to establish a uniform policy in the control of stream pollution, to assist each other in abating sources of pollution, and to facilitate the exchange of information on the treatment of industrial wastes and sewage. The chief engineers of the States involved have organized so-called boards of engineers which meet each year and keep in touch with each other by correspondence throughout the year so that new developments in the treatment of sewage and industrial wastes in one State are made available promptly to the other States. These boards have aided greatly in the solution of problems of waste treatment and have avoided duplication of efforts. Joint inspections are made also of pollution of interstate streams by representatives of the States affected and assistance rendered in abating such pollution. The cooperation of the War Department and the United States Public Health Service has also been secured in the study of stream flows and stream pollution.

As the result of these agreements each of the State departments of health now has available data for the treatment of the major industrial wastes. Another result of the concerted action taken under these agreements is the development by the coke industry, of successful methods of treating phenolic wastes from byproduct coke ovens and eliminating the discharge of these wastes into streams. Such wastes are not only inimical to fish life but produce very objectionable tastes and odors in public water supplies derived from sources polluted by them.

The discharge of oil from oil refineries, oil tankers and oil-burning ships is particularly inimical to water fowl. Their feathers become matted with the heavy viscous oil, which prevents them from taking flight. The fact that the Petroleum Institute, which represents most of the oil companies in this country, has of its own accord made a

survey of the pollution of the waters of the United States by oil wastes indicates that industry itself is beginning to realize its responsibility in preventing stream pollution. The technical committee of the Institute recently published pamphlets showing ways and means for preventing the escape of oil from oil refineries and preventing pollution from these sources. The discharge of oil has almost ceased to be a factor in many localities through the concerted action of the oil refining and shipping interests spurred on by the Federal Oil Pollution Act of 1924, which "prohibits the discharge of oil by any method, means, or manner into coastal navigable waters in which the tide ebbs and flows."

The most important and far reaching cooperative effort so far undertaken to control pollution is the Interstate Sanitation Compact that has been drawn up by the States of New York, New Jersey, and Connecticut. The rapidly increasing pollution of the tidal waters in the New York metropolitan area has been a matter of grave concern of the State and local health departments of these States. Although the problem of abating this pollution has been studied for a great many years by various commissions only a relatively small percentage of the sewage in the New York metropolitan area is receiving any treatment at present. The sewage treatment plants installed so far have been constructed primarily to give local relief where the conditions were particularly objectionable. The volume of sewage so treated has had no appreciable effect on the general problem and has not kept pace with the tremendous growth of the district.

Some conception of the magnitude of the problem involved may be gained from the fact that nearly 10 percent of the entire population of the United States is concentrated in the New York metropolitan area and that the sewage from over 12,000,000 persons, amounting to over 1,300,000,000 gallons, and the trade wastes from over 100,000 industries are discharged daily into the coastal and harbor waters of this district. This quantity of sewage has for years exceeded the assimilating power of these waters and has resulted in the entire depletion of the dissolved oxygen of the water in a number of areas. Of the total population contributing sewage, about 74 percent are in New York State; 20 percent in New Jersey; and about 6 percent in Connecticut.

It has been the general belief that the sewage and wastes discharged into the waters in New York Harbor and its tributaries are promptly carried out to sea by the large quantities of pure water of the Hudson River, Long Island Sound, and the Atlantic Ocean. The fact is that the sewage in the harbor drifts back and forth for days by the action of the tides and that less than 10 percent of the tidal flow at the Narrows consists of new sea water.

It is estimated that this enormous quantity of sewage and industrial wastes carries over 1,600,000 tons of sewage solids into the surrounding waters each year. One-half of these solids is putrescible organic matter. This material is deposited in the form of putrescible sludge in the steamship slips and channels of the harbor.

Extensive dredging operations have to be carried on each year in order to free the slips and channels of this sludge and other deposits. At the Brooklyn Navy Yard sludge to a depth of 3 feet

accumulates in 2 years' time and requires dredging at such intervals at an expense of $50,000 for that point alone.

It appears this sludge is creeping toward the bathing beaches and unless prompt action is taken to change conditions it will be only a matter of time before the sludge deposits will reach Long Island, Sandy Hook, and the bathing beaches in the vicinity, thereby rendering impossible the enjoyment of the great public beaches, built at a cost of millions of dollars and giving recreation and healthful enjoyment to millions of people. If this sludge should reach the sandy shores of these beaches, public recreation at these points would cease and thousands of persons who cater to the wants of the public would lose their livelihood. Already a number of beaches have been closed to bathing by the New York Department of Health, and others are threatened.

The effect of this pollution upon fish life has been marked. There is practically no fish life existing in certain areas of the district, due largely to the reduction of the dissolved oxygen content of the water. The economic loss due to this condition is hard to estimate. The injurious effect of the pollution on the shellfish is not so difficult to evaluate. Some of the most productive shellfish areas in the New York Metropolitan area have been condemned for shellfish cultivation. According to data furnished by the Conservation Department of New York State there has been a reduction in the number of acres of tidal waters under lease or franchise in this area for the propagation of oysters from 137,000 acres in 1915 to 9,300 acres in 1935. Furthermore, the cultivation of shellfish is prohibited in 81,000 acres of land under water in this district. This condition has resulted not only in a tremendous loss to the shellfish industry, but also a loss of revenue to the State of New York. Similar data have not been secured from New Jersey and Connecticut.

The pollution of bathing beaches and oyster beds finally aroused the public and certain metropolitan newspapers to a realization of the seriousness of the pollution problem and resulted in the calling of a number of conferences in New York City during 1930 to consider ways and means of correcting these conditions. These conferences were presided over by Senator Royal S. Copeland, formerly Commissioner of Health of New York City, and were attended by representatives of Federal, State, and municipal authorities, as well as other interested citizens.

As a result of these conferences, the three States, New York, New Jersey, and Connecticut, early in 1931 passed laws creating a temporary Tri-State Treaty Commission directed to "formulate the terms of a treaty between the three States and the Federal Government in the matter of the prevention and eradication of contamination and pollution of the natural waters flowing or situated between the States of New York and New Jersey, or the States of New York and Connecticut, and the natural waterways of said States flowing to any such natural waterways and the legislation, State and Federal, necessary to make such recommendations effective."

The Tri-State Commission appointed by the Governors of the three States was nonpartisan and was composed of men whose actions were governed solely by consideration of the best public interest. They were assisted by the best engineering and expert talent of the

States involved, and the compact as finally evolved stands out as one of the great achievements in interstate cooperation.

The first meeting of the Tri-State Treaty Commission was held in New York City on June 3, 1931. Mr. Joseph P. Day, of New York City, was elected chairman of the commission and Mr. Gerald W. Knight, of New Jersey, secretary. A number of subcommittees, including the committee of engineering and research, of which the writer was a member, was organized.

There were three outstanding problems with which the commission had to deal; namely, (1) the authority of the permanent interstate sanitation commission, (2) the area to be included within the district, and (3) the standards of purity of the sewage effluent and of the waters within the treaty area.

At first there was a wide difference of opinion among the commissioners as to the authority to be vested in the interstate commission. Some members advocated the creation of a superstate with powers of taxation and authority to construct and operate sewage disposal works within the area and to assess the cost of such works in proportion to the benefits derived. Other members felt that no permanent interstate commission should be set up but that State health departments of the three States should be vested with the sole authority for enforcing the treaty provisions. It was finally agreed that the enforcement of the treaty provisions should be vested largely with the existing State authorities, but that the interstate commission should have authority to draw up rules and regulations, issue orders, to investigate and determine if the requirements of the compact or orders of the commission were complied with and to bring action in its own name in the proper court or courts to compel enforcement of any or all of the provisions of the compact.

With respect to the treaty area, it was agreed and so stipulated that this area should comprise the tidal waters in the metropolitan district, including Newark Bay, upper and lower New York Bays, Sandy Hook Bay, and Raritan Bay, the Hudson River north to the northerly boundary line of Rockland and Westchester Counties; Long Island Sound as far as the easterly side of New Haven Harbor at Morgan Point in Connecticut, and the easterly side of Port Jefferson Harbor on Long Island, and the Atlantic Ocean to the easterly side of Fire Island Inlet on Long Island.

With respect to the standards of purity the compact points out "that where tidal waters are used for such varied purposes as bathing, navigation, shellfish culture, the development of fish life, and the disposal of wastes, no single standard of purity is practicable in all parts of the district." It was, therefore, decided to divide the waters into two general classes, namely, "Class A waters in which the designated water areas are expected to be used primarily for recreational purposes, shellfish culture, and the development of fish life", and "Class B waters in which the designated water areas are not expected to be used primarily for recreational purposes, shellfish culture, or the development of fish life."

After a careful study and consideration of the local factors involved, the following minimum standards were adopted by the Tri-State Commission:

1. All sewage discharged or permitted to flow into class A waters of the district shall first have been so treated as—

(*a*) To remove all floating solids and at least 60 percent of the suspended solids; and

(*b*) To effect a reduction of organisms of the *B. coli* group (intestinal bacilli) so that the probable number of such organisms shall not exceed one per cubic centimeter in more than 50 percent of the samples of sewage effluent; provided, however, that in the case of discharge into waters used primarily for bathing this bacterial standard need not be required except during the bathing season; and

(*c*) To effect a reduction in the oxygen demand of the sewage effluent sufficient to maintain an average dissolved oxygen content in the tidal waters of the district and in the general vicinity of the point of discharge of the sewage in those waters, at a depth of about 5 feet below the surface, of not less than 50-percent saturation during any week of the year.

2. All sewage discharged or permitted to flow in class B waters of the district shall first have been so treated as—

(*a*) To remove all floating solids and at least 10 percent of the suspended solids, or such additional percentage as may by reason of local conditions be necessary to avoid the formation of sludge deposits in class B waters of the district; and

(*b*) To effect a reduction in the oxygen demand of the sewage effluent sufficient to maintain an average dissolved oxygen content in the tidal waters of the district and in the general vicinity of the point of discharge of the sewage into those waters, at a depth of about 5 feet below the surface, or not less than 30-percent saturation during any week of the year.

The compact also provides that all sewage discharged or permitted to flow into any stream tributary to the tidal waters of the district shall be so treated if necessary as to maintain such stream in a sanitary condition at least equal to the requirements laid down for the tidal waters into which it flows.

The compact provides for setting up a permanent inter-State sanitation commission with authority to make investigations, conduct hearings, and prescribe by orders a reasonable date on or before each municipality shall treat its sewage in accordance with the standards specified in the compact. It also provides that nothing in it shall be construed to repeal or prevent the enactment of any legislation or the enforcement of any requirements of any signatory State imposing additional conditions or restrictions to lessen or prevent the pollution of water within its jurisdiction, and requires that the inter-State commission shall cooperate with the respective State authorities having jurisdiction over stream pollution with a view to coordinating their activities and securing the most satisfactory results. For this purpose the inter-State commission is authorized to prepare a general plan of the most practical and economical method of securing conformity with the compact and submit such plan to the Governor and the legislature of each State and to the State agencies having charge of sewage problems in the respective States.

The economic side of the problem was kept constantly in mind and every effort was made to promulgate standards that would produce maximum results with the least possible expenditure. But the standards adopted are not intended to be ideal standards which the signatory States should strive to meet but are the minimum requirements that will be tolerated in any case. In fact the compact provides that none of the signatory States should be prevented from "imposing additional conditions and restrictions to further lessen the pollution of waters within its jurisdiction."

The standards stipulate the results to be obtained leaving it to the States and municipalities involved as to how the results shall be reached. The minimum standards adopted, however, can in most

cases be met by simple and well-known methods of preliminary treatment. The tests required to determine if the standards with respect to the sewage effluent or the receiving waters are complied with are also simple and lend themselves to easy determinations.

It is felt that the standards for class A waters are sufficiently high to protect public health and fish life. In fact the *B. coli* standard for sewage effluent is only slightly less stringent than the minimum standards for swimming pools prescribed by the New York State Sanitary Code and are much more stringent than the minimum requirements for bathing beaches of New York City. The standards for class B waters, if met, should prevent the creation of public nuisances and support fish life.

In the case of class B water if all floating solids and 10 percent of the suspended solids are removed from the sewage and if the dissolved oxygen in the water into which it is discharged is not allowed to fall below 30-percent saturation, visible solids of recognizable sewage origin will be removed and no public nuisance or menace to health will be created in such waters. In fact, odor nuisances are not created so long as the dissolved oxygen is not depleted. If it had not been considered desirable to protect fish life a lower dissolved oxygen content would have been permissible.

With respect to fish life, studies made by Prof. C. L. Walker, of Cornell University, indicated that from 1½ to 2 p. p. m. of dissolved oxygen, equal to about 20-percent saturation, will support fish life. Thirty-percent saturation of dissolved oxygen will, therefore, give a factor of safety of nearly 50 percent when organic wastes of this type are considered.

The fact that shad are still able to penetrate the pollution barrier of the waters in the metropolitan area and reach the spawning grounds in the Hudson river at the Kingston flats 80 miles above New York Harbor every year under the present low oxygen content of these waters seems to be conclusive evidence that 30 percent saturation should not be inimicable to shad. Furthermore, if the dissolved oxygen in the vicinity of the outlet from disposal plants does not fall below 30 percent, the dissolved oxygen in the main body of the river will be considerably greater.

Although the dissolved oxygen content of the water is an important factor in the maintenance of fish life, it is not the only one. In fact chemical wastes, acids, and toxic substances, such as gas-house or coal-tar wastes are very destructive to fish life. The turbidity carried into streams by freshets and the dredging operations of rivers are also destructive to fish spawn. We should also remember that when considering the metropolitan area we are dealing with anadromous fish, such as shad, sturgeon, striped bass, and branch herring, which are much more hardy than some of the fresh-water fish like trout.

The legislation legalizing the compact and standards insofar as New York State is concerned was passed unanimously during the closing days of the 1932 legislature and signed by Governor Roosevelt on March 30, 1932. Although bills legalizing the compact were introduced in the New Jersey Legislature each year since that time it was not until last July that the necessary legislation was passed and signed by Governor Hoffman. The laws passed by New Jersey,

however, differed in a number of essential features from those passed by New York in 1932, so that it was necessary for New York to enact identical laws in order to put the compact into effect insofar as New York and New Jersey are concerned. Such legislation was introduced on January 2 of this year, passed by the legislature on January 14, and was signed by Governor Lehman on January 17, 1936. The compact was approved by a joint resolution of Congress on August 27, 1935. The compact so far as Connecticut is concerned will become effective whenever that State passes laws identical with those of the other two States.

It is believed that if the compact is faithfully carried out by the States involved, it will expedite the cleaning up of the tidal waters in the metropolitan area, will protect public health and the bathing beaches used by millions of bathers each year, and will return to shellfish culture many of the areas now condemned.

Although the health departments of a number of States have entered into agreements to control the pollution of interstate streams, as indicated above, this is the first time that legal representatives of three sovereign States have actually drawn up a compact pledging the abatement of the pollution of interstate waters. The ratification of this compact should have far-reaching effect on the control of stream pollution not only in the States involved but also in other States, which may have similar problems, and should give impetus to the battle for the conservation of our streams and waterways, which constitute one of our most valuable natural resources.

This compact has already created considerable interest, and the results produced by its enforcement will be watched keenly by State officials charged with the duty of controlling stream pollution. It is probable that other States having similar problems will follow the example set by New York, New Jersey, and Connecticut. The consummation of interstate pollution compacts, however, is apt to be a slow process. It requires nearly 5 years to have the compact under consideration ratified. It would probably have taken considerably longer had it not been for the seriousness of the pollution which threatened the closing of bathing beaches used for the healthful recreation of millions of people each year in the metropolitan area and the destruction of millions of dollars' worth of shore property.

There is a growing feeling among State health officials that the problem of controlling stream pollution is too big for the States to handle alone, and there is an increasing demand for Federal cooperation in the control of stream pollution and for Federal aid in financing sewage-disposal projects, especially where interstate streams and international-boundary waters are involved. This is substantially the conclusions reached by the Special Advisory Committee on Water Pollution in its report to the National Resources Committee dated May 3, 1935. This committee recommended in part as follows:

1. That powers and funds be granted to an appropriate Federal agency to institute a cooperative program of investigation with legally constituted State agencies for such special studies as appear desirable, and particularly for the development of appropriate standards for water use and control.

2. That in order to stimulate the construction of pollution-abatement works, funds for the purpose be made available by the Federal Government to local public and private agencies on a grant-in-aid or loan basis.

Although New York State is one of the eight States which have fairly satisfactory antipollution laws, a trained personnel, and reasonably adequate funds for control of stream pollution, the progress made in the elimination of stream pollution was far from satisfactory until Federal aid was made available for the financing of sewerage projects. This is evident when we consider the fact the population served by sewage-treatment plants under construction or authorized with Federal aid during the past 2 years is greater than the population served by all of the treatment plants constructed between 1903 and 1933.

Considering the enormous funds that all of the municipalities in the State have expended for home and work relief during the past 4 years, very few, if any, will be able to undertake costly nonliquidating projects of this kind without Federal aid.

In my opinion very few new sewage-treatment plants will be constructed in New York State outside of the New York metropolitan area during the next 10 years unless such aid is provided, and I believe that the same will be true in the other States of the Union. Whatever our opinion may be regarding Federal aid in financing local projects, the fact remains that unless such aid is forthcoming in the form of loans or grants there will be little progress in the elimination of stream pollution in the United States for a considerable time in the future.

Pollution of Streams from Mining Operations

(By Kenneth A. Reid, member, Pennsylvania Fish Commission, Connellsville, Pa.)

Stream pollution from mines represents the greatest single source of noxious pollution in the United States, and because of the tremendous volume of mine drainage, is perhaps the most difficult of complete solution. Metal, clay, or coal mines are scattered over most sections of the country and are all potential sources of pollution, but the latter is by far the greatest, because of the number of mines involved, their wide distribution, and the large volume of their discharge. In some of the eastern coal-producing States, notably Pennsylvania and West Virginia, coal-mine drainage exceeds all other forms of pollution combined, both in volume and devastating effect on streams, large and small.

In limited areas, largely in eastern Pennsylvania in the Susquehanna and Delaware River watersheds, the mining and preparation of anthracite coal has poisoned and blackened the streams on which these operations are located. While the water discharged from anthracite mines is normally acid, and sometimes to a high degree, the preparation plants, rather than the actual mining operations, are responsible for most of this pollution. Here the coal is crushed and screened into the desired sizes and then washed with large volumes of water to remove the fine, dust-like particles resulting from the crushing operation. This dust is carried away in suspension by the water, and when this wash water is discharged directly into the streams, as has been common practice for many years, it forms a fine black silt, known as culm, that blankets the bed of the stream,

smothering out and killing all aquatic life, and forming great black shoals or bars along the river banks as well as in the bed.

Each year these culm deposits have extended farther and farther down the rivers until at Harrisburg, many miles below the anthracite field, they are the source of a thriving business for a fleet of small dredge boats that remove this coal dust from the bed of the river and sell it as domestic fuel. Certainly if this fuel can be dredged out of the river and sold at a profit, the preparation plants can recover it more economically before letting it get into the river, and it is encouraging to note that the newer and more modern plants have now adopted this practice. Aside from this fine-coal recovery in modern washing methods, little has been accomplished toward solving the anthracite pollution problem.

Compared with anthracite, bituminous coal is much more widely distributed, and in several of the major producing States of the East and Middle West the number of mines runs into the thousands. Here the major pollutant is the acidulous water that either drains from or must be pumped from the workings in the mining of the coal—and usually continues to flow out years after the mine has been worked out and abandoned. Outside slate dumps or "gob" piles constitute an additional, though lesser, source of pollution through the process of oxidation and leaching of rain water through this acid-bearing material, especially when these dumps extend along or into the channel of a stream. Wet coal washeries are also a factor, although a small one when compared with the anthracite field or with the actual discharge of mine water in the bituminous field.

No satisfactory method has been devised for eliminating the acid menace of existing outside slate dumps. The best insurance for the future would be to induce coal operators to run them away from rather than toward or along the banks of a watercourse. Coal washeries, however, even of the wet variety, need not be a source of pollution. In some of the modern plants provision is made, through the use of dryers and settling tanks or "thickeners", for recovering the powdered coal from the wash water and recirculating this same water so that it is used over and over again. A large-scale example of the practical application of this method is to be seen in the splendid modern wet washery of the Buckeye Coal Co. at Nemacolin, Pa., where not a drop of the wash water is discharged into the river.

In the older bituminous coal-producing States both the volume and the percentage of acidulous mine water issuing from abandoned workings has increased year by year in comparison with that from active or operating mines so that it now constitutes the major volume in Pennsylvania, West Virginia, Maryland, and possibly some other States. The reduction or elimination of this acid from the effluent of abandoned mines is highly desirable from every standpoint and is a logical first step in attacking the coal-mine pollution problem.

When a mine is abandoned, it may take Nature from 50 to 100 years or more to correct the havoc wrought by man so that the water issuing from the old workings may again become neutral or alkaline. However, it was noted that some worked-out mines showed a marked reduction in the acidity of their effluents, and others were discharging alkaline water within a few years after their abandonment. Investi-

gations revealed that these mines had caved in and closed up many of the openings that formerly connected with the underground workings, and this, in turn, gave rise to the thought that perhaps the free movement of air through the mine might have some bearing on the acid condition of the water.

In 1924 the United States Bureau of Mines started an investigative study of the subject, assigning Mr. R. D. Leitch, of the Pittsburgh station, to this work. The theory that the presence of air and the resulting oxidation might be responsible for the formation of the sulphuric acid found in mine water and that the exclusion of air might prevent its formation was proven by laboratory and field tests. Similar work by the health departments of Pennsylvania and West Virginia confirmed and amplified these tests.

The source of the sulphuric acid found in most mine waters is the iron pyrites usually associated with bituminous coal seams. It is not soluble in water except when exposed to air, and consequently, although present and often in contact with underground water, it did not go into solution with the water until man admitted air in mining the coal. The oxidation of iron pyrites produces iron sulphates, which are soluble in water and readily undergo a chemical change in solution, giving off varying amounts of free sulphuric acid and iron salts. As less than 10 parts of sulphuric acid to a million parts of water will preclude the existence of the more desirable game fishes and approximately 50 ppm will kill all aquatic life, it is not hard to see how a small discharge of mine water may ruin a considerable stream when we consider that acidities of from 1,000 ppm to 3,000 ppm are common in mine drainage, while some mine waters show acidities well above 5,000 ppm.

Sealing an abandoned mine does not mean, as the name might imply, sealing the water in, but sealing the air out. Where water issues from abandoned workings water came out of the earth in the same neighborhood before the mine was opened, but in the form of pure springs, and if the mine is completely sealed without providing an outlet for this water, hydrostatic pressure will force it out somewhere, and in so doing will likely admit air and nullify the effects of sealing.

Mine seals at the point of discharge are of two general types: 1. Those that exclude air circulation by the use of a water trap under the sealing wall without raising the level of the water. 2. Those that exclude air by impounding the water to the roof of the mine behind the sealing wall with a French drain or other water escape at a higher level. The first avoids the danger of water breaking out at some unexpected point through thin cover, while the second often restores springs, long dry, by raising the underground water table. In some cases of impoundage all the water may find its way to the surface through these former natural openings, so that none goes out over the impounding wall.

But there is much more to sealing an abandoned mine than the masonry or concrete seal where the water comes out. In order to exclude air and prevent oxidation all air shafts, manways, surface cave-ins, crop-line breaks, and any other openings connecting the old workings with the outside air must be closed. For each major seal at the point of discharge there may be a dozen or more than a hundred minor openings requiring attention. However, many of these are

comparatively simple to handle, requiring only earth fills, which can be made by shooting with explosives, by pick and shovel, and in some cases most effectively with grading machinery.

In old mining regions where the cover or overburden above the coal seam is comparatively thin, pockmarked or honeycombed fields and hillsides, where the surface has caved in by reason of the removal of the supporting coal beneath it, are common features of the landscape. Many of these miniature depressions, cave-ins between the old pillars or stumps of coal that are left in the mine, readily admit air into the old workings. Even when they appear to be closed, they are a menace, for they interrupt normal surface drainage and permit much of this water to find its way down into the mine, where it becomes acidified and adds to the volume of the discharge from the mine. Surface water often forms a very large percentage of the volume of mine drainage, so it is desirable that these catch basins for surface water be leveled off, or at least be provided with adequate surface drainage.

Although the method of sealing abandoned coal mines had been known for nearly 10 years, no funds were available for actually carrying out the work until December 23, 1933, when approximately $1,500,000 was allotted to the United States Public Health Service under a Federal Civil Works Administration project for the conduct of the work in nine Eastern States. True to the history of movements in the interest of pure streams, the initiative that was responsible for the eventual allotment of funds after a long fight in overcoming fancied objections of Federal officials, came not from governmental agencies entrusted with the protection of our streams, but from sportsmen and conservationists, with the wholehearted support of the Izaak Walton League, American Game Association, Pennsylvania Fish Commission, and other conservation and wildlife organizations that had no official recognition in the conduct of the work.

From that time until the fall of 1934 the project ran the gauntlet of successive alphabetical agencies with frequent stops and changes in regulations and set-up that did not make for efficient conduct of the work. Nevertheless, in spite of these many handicaps, much real good was accomplished and the public was beginning to realize that, of all the work-relief projects, sealing abandoned coal mines was about the most worth while from the standpoint of truly public benefits. Farmers were able to water their stock in streams that were formerly highly acid, and sometimes to use springs that had long been dry or acid, fish return to streams that had been sterile for years, and public water companies began to see an improvement in their source of supply. The mileage of reclaimed streams in West Virginia and Pennsylvania was appreciable when the work was stopped, in spite of the fact that only a small fraction of the possible work had been completed.

To give some idea of the work that was actually done, the following figures from Pennsylvania should be of interest: 1,004 drift openings, 197 shaft openings, 24,182 cave holes, and 103,121 feet of drainage ditches were completed at a total expenditure of $321,823—a little over half of the money that was supposedly allocated to the State for this work.

After a lapse of nearly a year, a second project for sealing abandoned coal mines has been approved, carrying a total allocation of

$3,500,000 to the Public Health Service for the conduct of the work in the eight States of Pennsylvania, West Virginia, Ohio, Indiana, Maryland, Kentucky, Tennessee, and Alabama under their respective health departments. Again the approval came in December just at the beginning of real winter, when it is most impracticable if not quite impossible to do this type of work effectively, so that little can be expected in the way of actual construction work before the weather breaks in April, at least in the Northern States. In the meantime the States can do much of the necessary preliminary work, such as locating and mapping the openings, getting releases from the landowners, and securing and analyzing samples of water from the effluents. With the valuable experience of the former project behind them, and the intention of carrying on the work by watersheds, working from the headwaters down, we can expect real results next spring and summer, if the funds allocated are not recalled and the project is allowed to continue through the warm months when the work can really be done to advantage. Obviously, too, any mine-sealing work to be really effective should have periodic check-ups to ascertain the improvement in the water and to take care of maintenance necessitated by cave-ins or breaks that may occur after completion of the sealing work.

The drainage problem of active coal mines is not so simple. Comparatively little research has been devoted to the problem of removing or neutralizing the acid from the effluents. In a crude way it can be neutralized by the introduction of lime, but the quantities involved are so great as to make the cost prohibitive except for emergency treatment. A few companies have done some experimental work along this line, and at least one was sufficiently successful to render the highly acidulous water from its mine sufficiently pure for coke-quenching purposes, while the sale of byproducts recovered in the process and used as paint pigments a little more than paid for the operation of the treatment plant. However, mine water is a highly variable quantity, both in analysis and acid content, and in fairness to the coal industry it should be said that a great deal more research is needed in this particular field, generally considered as the one great unsolved pollution problem, before it can be fairly stated that economically feasible methods are known.

On the other hand, while individual companies here and there have shown a sincere desire to cooperate in attempts to solve their pollution problems, the industry as a whole takes the position of lassiez faire, and through its representatives has in the past actively opposed practically every movement that even suggests possible interference with their drainage systems. Had the effort and energy of the industry devoted along this line been devoted to a sincere effort to solve this public problem, for which they are primarily responsible, the practical solution would be much nearer realization.

A preventive is always better than a cure, and if we can prevent the formation of acid the problem is solved at the start. In 1927 the Bituminous Mine Drainage Survey Corps of Pennsylvania began a field study of active mine drainage. At first their work was largely confined to concentration of the drainage from one mine or several adjoining ones into a single discharge entering a stream as far down as possible. Where there might be an option between an unpolluted

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A, Black-tailed deer in Montana. (Forest Service photo.)

178783

B, Deer in the Pisgah National Forest, N. C. (Forest Service photo.)

B31181

A, Buffalo traveling on the National Bison Range, Mont. (Biological Survey photo.)

B33446

B, Buffalo trio grazing on the National Bison Range. (Biological Survey photo.)

and an already polluted stream, efforts were made to have the drainage go in the latter.

Later it was noted that sometimes this concentration of drainage in large underground sumps brought about a reduction in the acidity of the composite effluent, and the successful principle of sealing abandoned mines was also applied to abandoned and worked-out sections of active mines. While the actual chemical reactions that apparently bring about a material reduction of acid content in these large sumpages are rather imperfectly understood, the results are quite encouraging, judging from reports from a considerable number of mines that have applied the principle in their mining operations. When an operator can bring about a material reduction in the acidity of the water that he is forced to handle, it is decidedly to his financial advantage to do so, for it will enable him to cut his drainage costs by eliminating many costly replacements on pumps and pipe lines that are literally eaten up by many highly acid mine waters. The application of these two principles in active mining operations promises more worthwhile results in this field than any other methods known and contemplated at the present time.

With the abandoned-mine problem now well on its way toward solution and the likelihood of considerable improvement being effected in the discharge from active mines, it would seem that the problem of coal-mine drainage was fairly well in hand, but, unfortunately, such is not the case. There is one determining factor in the program that so far has been entirely neglected, and that factor is the potential new mine that does not now exist, but which stands as a constant threat on every watershed that is underlaid with coal. There are many reasons why the opening of additional new and unneeded mines should be regulated in the public interest and not a single valid reason for not doing so.

If there is any product in the country that is badly overproduced and has been for many years, that product is bituminous coal. During the war everyone who had a block of coal or could lease or buy one opened up a mine, and when the abnormal demand ended they were loath to quit. As a result production facilities of existing mines were, and still are, far above the demand for coal, with the result that prices dropped below production costs and the industry became badly demoralized—a condition from which it has never completely emerged because of a continuing excess of existing production facilities over demand for the product. Anything that would curtail the addition of new tonnage would prove of distinct benefit to the coal industry as well as the public.

Government regulation to curtail the opening of new and unneeded mines for the benefit of operators already in the business would be branded as unfair special interest legislation and would likely encounter legal entanglements. But there is another and better way to accomplish this obviously desirable end. Coal is a basic, irreplacable, and nonrenewable natural resource that is being grossly wasted by present competitive methods of mining. The opening of a coal mine is more than the exclusive concern of private capital on private land. It is distinctly social and public in its aspect when it causes acidulous water to be formed and flow down over the lands of others, adversely

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affecting much land and many people below. In view of these considerations, it seems not only highly desirable but entirely proper that some agency of the Government function as a licensing board for proposed new mines. If the applicant could put up adequate guarantees that his water would not pollute an unpolluted stream and that he would properly seal the mine on completion of operations, he would qualify for a permit; otherwise he would not. By making pure water the deciding factor of the permit, the public would be spared much wholly unnecessary pollution, the coal industry would be on the road to sound and lasting stabilization, and the plan would be eminently fair to all.

As evidence of the magnitude of this problem and the necessity for adequate control, reports from the Pennsylvania Department of Mines show that during the last half of 1935 there were 154 new mines opened, and 5 old mines reopened, as compared with only 6 mines abandoned—and this in the face of the fact that in the same State there are scores of well-equipped mines shut down and their employees idle, or working only part time because of lack of business. One of the worst features in the indiscriminate opening of mines is that in some sections the good work accomplished at public expense by mine sealing has been nullified because irresponsible parties have destroyed the seals in order to mine out a few stumps or ribs of coal remaining in the old workings—and in Pennsylvania, at least, there appears to be no effective way of stopping them or penalizing them for such unwarranted actions.

This lack of control over the opening of unneeded mines is the obvious weak point in the mine-drainage picture. It reminds one of the fellow in the north country trying to exterminate the black flies—as fast as he killed one, two more would take its place. As long as this weakness exists we are handicapped about as badly as the medical profession would be in attempting to cope with a rankly contagious disease without the authority to establish a quarantine to stop its spread.

Without attempting to "whitewash" the responsibility of the present active mines or minimize the part they play in the mine-pollution picture, orderly procedure and fairness would demand that we concentrate our efforts first on the abandoned and potential mines. If we give proper burial to the dead and abandoned forbears of the active living mines and provide adequate regulation over their unborn progeny, the major part of the coal-mine pollution problem will be solved on a permanent and stable basis. Then it will be time enough to turn our attention to the active mines.

Man cannot stop the flow of water, even if he can stop other things. A flowing river follows the law of gravity.

Oil Pollution in Coastal Waters

(By Paul S. Galtsoff, U. S. Bureau of Fisheries)

The tremendous development of the petroleum industry in the United States during the last two decades can be appreciated by the fact that its capital investment of one-half billion dollars reported for 1914 increased by 1932 to $12,000,000,000. The growth of the industry, accompanied by a corresponding increase in the consumption

of its products, has created many and different problems as to the disposal of its wastes. During this time the dumping of oil by distilleries, refineries, tankers, oil-burning steamships, leakage, and waste from oil fields increased at such a rate that oil pollution of coastal waters became an obvious nuisance which aroused great apprehension as to its eventual effects on marine life. So intense was the pollution in principal harbors and bays that a possibility of recovery by skimming off the oil from the surface of waters was seriously considered. The gravity of the situation has been realized by the authors of the Oil Pollution Act of 1924 passed by Congress, which prohibited the "discharge of oil by any method, means, or manner into coastal navigable waters in which the tide ebbs and flows."

The deleterious effect of water-soluble pollutants can be minimized or at least regulated by proper dilutions. In the case of oil, insoluble in water, the dilution factor plays lesser importance. It has been demonstrated experimentally that oil placed on a clean-water surface has a tendency to spread until it forms a monomolecular layer. The presence of other contaminating substances which lower the surface tension may interfere with this process with the result that spreading is stopped and films of greater thickness remain floating on the surface. These films are recognizable by bright bands of color.

Experiments carried out at sea with large quantities of oil pumped overboard (hearings, etc., H. R. 10625, 1930) show that there exists a definite relation between the thickness of the film formed and the amount of oil dumped. The following figures indicate the approximate quantity of oil to form a film 1 square mile in area:

	Gallons of oil per square mile	Appearance of film
Thickness of film in millionths of an inch:		
15	25	Barely visible.
30	50	Visible as silvery sheen.
60	100	First trace of color.
120	200	Bright bands visible.
400	666	Dull color.
800	1,332	Dark color.

Very thin films up to 30 millionths of an inch do not persist on an agitated water surface for more than 5 hours and films about 40 millionths of an inch disappear in less than 24 hours. From these data a conclusion has been drawn that oil may be discharged into surface waters at the rate of 10 gallons per hour per square mile without causing visible pollution, providing the distribution is uniform over the entire area. The natural phenomena responsible for the disappearance of surface films are, however, but vaguely understood, and little is known about the eventual fate of oil thrown into the sea. From the biological point of view the disappearance of the oil from the surface does not mean that the pollutant has been eliminated. As will be shown later, its effects may still persist when no traces of oil are visible on the surface.

Oil may affect marine life in various ways—by spreading into a film which interferes with the gaseous exchange; by coating the bodies of birds, fish, and other animals; by direct toxic action of the substances soluble in water; by a repelling action on the mi-

gratory fishes and other marine animals, forcing them to turn away from the streams and bays they were accustomed to enter; and by interfering with the natural food cycle in the sea and the propagation of minute organisms which constitute the essential diet of larger forms.

The intercepting effect of an oil film on the surface of water has been probably greatly overestimated. Laboratory experiments (Gaarder, 1918; Nozawa, 1929) have demonstrated that in order to completely prevent the exchange of gases a layer of heavy paraffin oil must be at least 3 centimeters thick. The thin film commonly found on the surface is easily broken by waves and cannot prevent the absorption of oxygen by water.

The coating of the gills of fish and clogging them with particles of oil may constitute a more serious danger. It has been noticed that the organisms covered with ciliated epithelium as, for instance, oysters, clams, and sea anemones are not injured by a brief submerging in oil which is soon washed away by the action of the cilia, whereas the animals deprived of this means of protection, as for example, fish and shrimp, are greatly injured by the contact with oil.

Oil dumped in water rapidly disappears from its surface. It is avidly adsorbed by particles of clay suspended in the water and is deposited on the bottom where it remains for a long time. The more sediment found in the water, the more rapid will be the precipitation of oil. However, the deleterious effect continues to persist since oil absorbed by mud and deposited on the bottom remains a source of pollution. By stirring the bottom large patches of it are released and float again on the surface giving out toxic substances which are gradually leached by the water.

The toxic effect of oil has been demonstrated by Roberts (1926) who found that the extracts prepared by shaking a sample of oil with water were poisonous to brown trout and by Gardiner (1927) whose experiments with aqueous extract of tar show that 110–115 days-old trout were killed by a 15-minute immersion in solution of 40:100,000 phenol. More recently the United States Bureau of Fisheries conducted a comprehensive study of the effect of crude oil of Louisiana wells on oysters. It has been found that crude oil mixed with sea water yields water soluble substances which produce anaesthetic effect on the ciliated epithelium of the gills. In feeding, the oysters filter large quantities of water pumped by the gills. Obviously, any agent which reduces the rate of feeding materially decreases the amount of food obtained by the organism and if permitted to act for a long period of time will cause starvation and possibly death.

This toxic effect of oil extracts in sea water has been demonstrated by a number of experiments in which permanent records were obtained by means of a rather complex electric set-up, the description of which is given in the paper of Galtsoff et al, 1935. An analysis of abundant experimental material shows that the rate of feeding of the oyster decreases in direct proportion to the concentration of oil extract. Toxic action of oil apparently is due to the organic constituent of the oil, but not to its mineral salts which may be

leached in preparing the extract. This conclusion is based on the observation that 28 repeated washings of a sample of oil with water failed to decrease the toxic potency of the sample. In the light of these experiments it is possible to conceive that oil held by the mud and deposited on the bottom, continues for a long time to yield substances injurious to aquatic life. The disappearance of the film of oil from the surface is therefore not a sign of the end of pollution.

The results of this work are in agreement with the investigation carried out some years ago with the Baku petroleum by Russian scientists, who have demonstrated that toxic action of the Russian petroleum is due to the presence of hexahydrobenzoic acid ($C_6H_{11}COCH$) which kills perch and minnow in dilutions of from 4 to 16 parts per million. Naphthenic acid has been found toxic to other organisms, as for example, fresh-water crayfish which are killed by concentrations of 5–50 parts per million in from 18 to 60 hours. Whether the effect of Louisiana oil is due to the same hydrocarbons which are responsible for the toxicity of the Russian petroleum, remains to be ascertained.

Microscopic organisms providing the necessary food for larger animals and therefore playing an important role in the food cycle of the sea, are also affected by the presence of oil. To throw some light on this important aspect of oil pollution, experiments were undertaken by the Bureau of Fisheries with a culture of a marine diatom, *Nitzschia closterium*, which normally occurs in estuaries and shallow bays. In these experiments, carried out under controlled laboratory conditions, *Nitzschia* was grown both in the natural sea water and in a special medium to which various amounts of oil and oil extract were added. The growth of the culture was measured by means of a photoelectric set-up fully described in the previous report (Galtsoff et al, 1935, pp. 193–204). Ample evidence obtained in the course of this investigation shows that the presence of a heavy layer of oil on the surface of the water inhibits the growth of the diatom, when oil remains on the surface for a week or longer. The retarding effect of the water-soluble fraction of oil on the rate of propagation of *Nitzschia* is apparent in concentrations of 25 percent and higher and when the extract is permitted to act over a considerable period of time. It must be borne in mind that no attempts were made in these experiments to determine the exact concentrations of the water-soluble fractions which were prepared by shaking 2 volumes of oil with 1 volume of water and separating the water fraction after the mixture was permitted to stand for 12 hours. This extract was diluted to the desired concentration. In many instances the addition of oil extract stimulated the growth of bacteria and was responsible indirectly for the death of the diatoms. Retardation of growth was also observed when collodion bags filled with oil were suspended in the culture. There was a gradual osmosis through the membrane of water-soluble substances which inhibited the growth of *Nitzschia* cultures. Results of these experiments prove that oil in water has a twofold effect on oysters and other shellfish. It retards and interferes with the propagation of diatoms which constitute the principal diet of many molluscs and reduces the rate of feeding by exerting a narcotizing effect on the ciliated epithelium.

Both effects tend to cause the underfeeding and even starvation which may lead to an emaciated condition of the animals' flesh and their death.

During recent years there has been a considerable development of the oil fields along the coast of the Gulf of Mexico. Careful geophysical surveying along the Louisiana shores disclosed the location of a great number of salt dunes, potential sources of oil. So far only a small number of them have been drilled and are at present in operation, but there is no doubt that in the future all of them will be developed.

The location of wells in the open waters in Terrebone Parish, La., in the most important oyster-producing region of the State, is probably the best example of the hazards to the fishing industry caused by the development of oil fields. Incidental pollution of water when wells are being drilled is difficult to avoid. Furthermore, oil coming from wells is usually accompanied by brine or so-called "bleed waters" containing various salts and loaded with poisonous hydrogen sulphide. Experiments on oysters and *Nitzschia* indicated that, although bleed water is less toxic than oil, it exerts a similar effect on marine life. In view of this fact, its presence in the natural sea water is undesirable.

From the experimental evidence gathered by the recent investigations, the conclusion is unavoidable that oil pollution produces profound changes in the normal marine environment. The water-soluble substances gradually dissolving from oil deeply affect the feeding mechanisms of mollusks, attack the nervous and respiratory systems of fish, and interfere with the normal food cycles. Furthermore, they impart an oily flavor to the meat, rendering seafood from polluted water unsalable.

The way to avoid the unnecessary devastation caused by negligence and disrespect toward our natural resources will be easy to find when the extent of damage by oil pollution is realized and the manner in which the pollutant affects life in the sea is fully understood. There is no doubt that modern technical sciences can devise methods which will provide full protection to our waters without hindering the development of new oil fields or curtailing the use of oil. The solution is obviously not a biological one but an engineering problem. It will be found as soon as the majority of the people cease to look upon our bays, streams, and estuaries as huge dumping places for the disposal of sewage and garbage and realize that these are the greatest natural assets which the present generation holds in trust for those who will live after us.

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DISCUSSION

It was moved, seconded, and unanimously carried that this conference endorse the amendment to the Oil Pollution Act to cover discharges of oil from the shore as well as vessels; that is to say, the amendment as drafted by the Legislative Council of Congress.

It was moved, seconded, and unanimously carried that the matter of enforcing the Oil Pollution Act be called to the attention of the Biological Survey and Department of Agriculture.

The Effect of Oil Pollution on Waterfowl

(By Frederick C. Lincoln, U. S. Bureau of Biological Survey)

The era in which we live has been called "the age of steel", but it might with equal propriety be termed "the age of oil", for oil in a thousand ways has come to be the driving force behind our civilization. Nevertheless, it is a singular irony of fate that this same oil, a residual deposit from the ancient vanished life of the earth, should be destined to cause such widespread suffering and destruction to various forms of present-day aquatic and avian life. Driving the wheels of industry, making possible the development of an age of transportation by land, sea, and air, and contributing in many ways to the comforts and refinements of our lives, this same black gold, when improperly handled or permitted to escape beyond the bounds of our control, is to be reckoned as one of the major destructive agencies to birds, fishes and other forms of aquatic life.

Practically all agencies that are engaged in the production, transportation, handling, or use of oil must be considered as actual or potential sources of pollution of both coastal and interior waters. Prominent in this category are oil-burning and oil-cargo vessels and other floating craft that use oil in any manner, oil wells and fields, oil terminals or loading points, refineries, railroads, civic dumps, and a host of industrial plants of different kinds, including large public garages.

Unfortunately, few persons have had personal experience with this appalling evil and you will, I am sure, be interested in knowing just what effect oil pollution has upon ducks and other water birds. When they alight upon an oil-covered water surface their feathers quickly become so saturated that they are unable to again take flight. The fine down that insulates their bodies against cold and water becomes matted and water-soaked, the skin is exposed to the elements, and the bird dies from cold and hunger unless death comes more mercifully from drowning. A bird once oiled is doomed to death, and I know of no more pitiful sight than a duck or other water bird with its plumage plastered with heavy, black, tarry oil, its wings

stuck to its body as it staggers along the beach or tries to maintain itself in the water by swimming. Reports have indicated that some constituents of mineral oil may have a caustic or other toxic effect upon birds, but I do not believe that this has been definitely proven.

I have brought with me, for your examination, a specimen of lesser scaup duck, or, as it is more generally known among sportsmen, bluebill or blackhead. The plumage of the back of this bird should be pure white, finely lined with delicate gray lines. It was alive when brought to me and I am sorry to say that this case of oil pollution is only one of many that have occurred almost within the shadow of the Capitol. As a matter of fact, this bird came from the new refuge of Roaches Run, across the Potomac on the Mount Vernon Memorial Boulevard. The oil came from the extensive dumps that extend on the west side of the refuge and can be traced to areas where old automobiles have been wrecked for salvage purposes. Also, in this dump there are literally truck loads of oil-soaked waste that after each heavy rain provides a considerable quantity of oil to be carried down the drain into the refuge area. I am, however, glad to report that this situation has now been remedied so that the drainage of the dump is being carried around the refuge.

This, of course, is what might be termed an isolated case, but what about the birds that use our extensive coastline from Callais, Maine, to Seattle, Wash., not to mention interior rivers, creeks, lakes, and ponds?

They are all subject to this terrible destructive factor. Several years ago a biologist of the Survey picked up 59 eider ducks, scoters, and other sea birds near the Great Point Light in Massachusetts, finding 10 oil-soaked eiders within a beat of 70 yards. At that same time another representative of the Bureau, covering the ocean front from Nantasket Beach to Cohasset, Mass., found several hundred oiled ducks and other birds. A report the following year from this same general region is graphic:

> * * * The number of poor birds we found down there covered with oil is perfectly awful. Coots (scoters), brant, old squaws, everything. The amount of oil varied from a little on the breast to so much they could not fly, but could only paddle about until they starved. Several had plucked themselves almost clean trying to get rid of the stuff.

The disaster to the steamer *Robert E. Lee* off Manomet Point, near Plymouth, Mass., in the spring of 1928, was a veritable holocaust to waterfowl, caught as they were in full migration to their nesting grounds. Fuel oil was released in large quantities and it was not long until the beach on the north side of Cape Cod was literally covered with dead and dying black ducks and others. One report stated that thousands of dead ducks were found along the East Sandwich Beach.

The waters of Rhode Island have for years been plagued by this curse, and in 1919 State wardens gathered up and buried 494 bluebills that had been killed by oil in Narragansett Bay, while a Federal warden, working in the same region in 1921, picked up and disposed of more than 900 ducks that had been killed by oil. Remember, that was 90-limit bags under the last shooting season regulations and may explain why some of you didn't get yours.

Conditions in Long Island Sound are notoriously bad despite the efforts of the district engineer to abate the nuisance. A report of the

Shipping Board issued 10 years ago concluded that each year "possibly as much as 5,500 tons of heavy oil are discharged * * * near New York Bay from ballast water alone." Each year literally hundreds of ducks are killed by oil in these waters, resulting in much righteous indignation on the part of the sportsmen of the district. This is, of course, a heavily industrialized section, and there is evidence that in addition to the shipping a serious source of oil pollution is the shore plants of various kinds.

Going on down the coast to Delaware and Chesapeake Bays, it is found that the situation is just as bad. Investigations made within recent months by officers of the Bureau of Navigation and Steamboat Inspection have shown that the oil pollution in Delaware Bay comes not only from the oil-burning and oil-cargo vessels using that waterway but also from a number of well-known oil companies having oil-loading points or refineries in the vicinity of Philadelphia. Reports are frequently received from hunters in the Chesapeake Bay area who find ducks unable to fly and which upon examination are found to be smeared with a thick, black, tarry oil.

A well-known naturalist, hunting waterfowl a few years ago in Pamlico Sound, N. C., reported that of about 400 ducks, geese, and brant examined by him, 16 were so badly oil-soaked they were unfit for use, and added the comment: "If anything like this percentage can be applied to all the birds, the damage from oil must be appalling." The victims in this case were chiefly redheads and brant, two species already so reduced in number that their future existence is seriously threatened.

In the coastal regions of Louisiana and Texas, oil pollution can be particularly disastrous because of the heavy winter concentrations of waterfowl. The situation in this district is aggravated by the presence of oil fields, which at times have been responsible for the contamination of large areas. In this section small streams will sometimes be completely covered with oil allowed to escape from wells or storage tanks. The large earthen tanks, if uncovered, may become veritable death traps, as was the case reported by a Federal game management agent who examined such a reservoir and found fully 500 dead ducks on the surface of the oil, with evidence of the remains of a great many more along the shore. Other tanks examined also had their quota of dead or dying ducks and other birds, although in smaller numbers. Residents of the communities visited stated that these open storage tanks were responsible for the death of thousands of ducks each year.

On the Pacific coast, pollution by oil has been particularly severe in California waters. A few years ago the keeper of the Farallon Light Station reported that—

> the rocks and beaches are lined with wandering birds covered with crude oil. The number runs into the hundreds * * * all doomed to die of slow starvation.

Fortunately, the California Fish and Game Commission has shown a commendable activity in its efforts to stop such contamination of coastal and interior waters, and fines of several hundred dollars have been imposed upon ships' engineers and oil companies. One company indicted and found guilty was given a suspended sentence upon the condition that the conditions would be cleaned up. Indicted a second time, the judge insisted upon payment of the original fine and at the same time handed down a scathing denunciation of such

disregard of public welfare. Large numbers of waterfowl also have been killed by oil in San Pueblo, San Pedro, and San Francisco Bays, and upon the lower reaches of the Sacramento River.

Puget Sound, Wash., has been the scene of heavy mortality of waterfowl from this cause. One case, in 1924, which occurred when a heavy freeze had concentrated the water birds in the waters of the Sound, killed several thousand birds.

The nuisance naturally is not so bad in interior waters, but nevertheless, it is sufficiently serious to be intolerable to every conservation-minded naturalist and sportsman. Reports of the destruction of ducks by oil at interior points are available from Tennessee, Arkansas, Illinois, Oklahoma, Utah, Montana, Nevada, and Ohio. The last is a new State to be added to the "oiled" list, due to the killing of ducks by oil in the harbor at Cleveland, during the current season.

It is not, however, entirely from an appeal to sentiment that we must consider this problem, as we are concerned with an industry that is worth literally millions of dollars to the Nation, and of untold value to its citizens from the viewpoint of healthful recreation.

Congress has already recognized the menace of oil pollution in the passage of the Oil Pollution Act of 1924, which prohibits the dumping of oil or oily wastes upon the territorial coastal waters of the United States from any oil-burning or oil-cargo vessel. For obvious reasons, the enforcement of this law is a very difficult matter, as the mere presence of oil on the surface of the water in the vicinity of an oil-burning or oil-cargo vessel is not conclusive proof of guilt. Nevertheless, the War Department, which is charged with enforcement, has been remarkably successful, several cases having been satisfactorily terminated during the past year in the Federal court at New York.

In 1926, the United States Government called a conference in Washington of the principal maritime powers of the world, in an effort to come to some decision that would result in a multipower treaty for the abatement of this nuisance on the high seas. Three of the powers, Italy, Germany, and Japan, declined to sign the agreement, so we do not yet have any international regulation concerning the dumping of oil or oily waste upon the high seas. This is an important matter for the reason that experiments have demonstrated that oil will drift on the surface for long distances. Through the interest of Great Britain, the subject has again been revived and is now under discussion by the League of Nations. Communications on this subject from the League are referred to the Interdepartmental Committee on Oil Pollution, of which your speaker is the member representing the United States Department of Agriculture. The attitude of the American Government is already well established, and we are, accordingly, hoping that the time is not far distant when an oil pollution treaty will be concluded so that we may have adequate control of oil pollution from maritime sources.

The importance of this will be more apparent when we consider the rapid application of oil to the propulsion of vessels on the high seas. This is vividly illustrated by the consideration of a few figures from Lloyd's Register. In 1914, there were only 501 vessels

with a gross tonnage of 1,721,747. By 1925 this had increased to 3,822 vessels of 19,372,615 gross tons, and in 1935 to 31,189,761 gross tons. Of this last figure, the vessels flying the American flag totaled 8,653,722 tons. These figures include only those vessels of 100 gross tons or more. Nearly half the shipping of the world, actually 49 percent, is now moved through the use of oil. Also, in considering the figures I have given, it should be remembered that they apply only to the vessels using oil for propulsion and while undoubtedly included in the gross tonnage, we do not have actual figures on the number of oil tankers that habitually return to their home ports with sea water ballast in their tanks which must be emptied at or before port is reached.

When it comes to oil pollution of interior waters there is not at the present time any Federal legislation that covers these land sources. An act of Congress of March 3, 1899, prohibits pollution of navigable streams by materials that might be considered obstructions to navigation. At that time pollution by mineral oil was not anticipated and it would seem that the easiest way to effect the desired results would be for Congress to amend that act to cover any refuse matter that is at all objectionable, but making specific mention of oil or other hydrocarbonic waste.

Many States have passed stringent antipollution laws, which if vigorously enforced would do much to rectify the deplorable conditions existing in vast areas of coast, river, and marsh. A very few States have shown a most commendable activity in enforcing these laws, but in most others they merely exist on the statute books. Accordingly, since it seems quite obvious that such measures will not supply a cure for the evil, it appears necessary for the Federal Government to again come into the picture, either under the commerce clause of the Constitution or the Migratory Bird Treaty with Great Britain.

We are now bending every effort to effect the restoration of our wildlife resources at the expenditure of large sums of public money. Every cause of loss that can be eliminated is just that much back in our pockets and our game bags, and the elimination of most of the loss through oil pollution can be accomplished.

(Mr. Lincoln brought a duck along for demonstration. He also had two letters, one dated Feb. 1 from Oak Bluffs, Mass., and one dated Feb. 3, from Point Pleasant, N. J., referring to the large numbers of oiled birds in their regions at the present time.)

The point has been raised as to whether the Department of Agriculture, itself, has authority to prosecute any agency responsible for killing a protected bird whether by oil or otherwise.

In conclusion I want to refer to this: There is now pending in Congress measures in the hands of Rivers and Harbors Committee certain amendments which will probably go a long way. Matter was discussed many times last year with Mr. Darling and others, and as a result a suggested bill was developed and later had conference with Committee on Conservation of Wildlife. It was found that the Rivers and Harbors Committee had a bill ready at the same time. It was introduced during the latter days of last session of Congress. It is still a live issue, and we hope something will be done during the current session.

DISCUSSION

Senator LONERGAN. I am satisfied the only way to deal with this subject is to try to get Federal legislation. Insofar as I am concerned, the die has been cast and I am going to try to have a law passed that will deal with this. Through the cooperation of Mr. Ladner and assistance of legislative council of Congress a bill has been prepared. This bill is to be presented to you for your information. Mr. Ladner will read it now, paragraph by paragraph, and I would like to have this conference express its approval of this proposed legislation, and also to have the larger conference so express approval. I have talked with men in high position at the Capitol on this subject, and I have yet to meet the man who opposes this proposition. I served on a commission in my own city of Hartford, Conn., many years ago. I am familiar with the problems in my own State. I know that the industrialists in Connecticut would not approve of this legislation. Most of them are my personal friends, but that does not change my cause. It is clear that States cannot deal with this problem. The best way to illustrate is to talk about the Connecticut River. Industries have deposited impurities in the stream. Municipalities have deposited impurities in the stream, destroying fish life.

I regard this as one of the great needs of the Nation. We have one of two things confronting us—water pollution will destroy us if we don't destroy it. To have this legislation enacted will be a slow process. It might take a year or two, but that is nothing. I congratulate you here that you have an interest in this subject—not for the purpose, as a newspaper writer said, of supplying game to 1,300,000 sportsmen in the United States. That was what the paper said was the purpose of this conference. That is not so—this conference deals with human life itself. Let's get to work. Mr. Ladner, will you please read this proposed bill? I am sorry I have to go, but before I was invited to come here, made an important engagement at the Capitol and have to leave now.

PRELIMINARY DRAFT OF STREAM PURIFICATION LEGISLATION

[NOTE.—This is a preliminary draft of legislation for a national authority for stream purification and to abate stream pollution. It is subject to corrections, additions, and alterations as may be suggested at the pollution conference of the President's Conference on Wildlife and Conservation.

The bill, drafted by Senator Augustine Lonergan, Connecticut, is the result of approximately 2 years of conferences and expert study of the problem under his guidance.]

A BILL To prevent the pollution of the navigable waters of the United States, and for other purposes

(Read by GROVER C. LADNER, Deputy Attorney General, Department of Justice, Commonwealth of Pennsylvania, Harrisburg)

Be it enacted by the Senate and House of Representatives of the United States in Congress assembled:

NATIONAL RESOURCES COMMITTEE

SECTION 1. The National Resources Committee (in this act referred to as the "Committee") established by the Executive Order No. 7065, of June 7, 1935, is hereby made a permanent establishment of the United States. The committee shall be composed of the Secretary of the Interior, the Secretary of War, the Secretary of the Treasury, the Secretary of Agriculture, the Secretary of Com-

merce, the Secretary of Labor, the Federal Emergency Relief Administrator, who shall serve as members without additional compensation, and three other members who shall be appointed by the President, by and with the advice and consent of the Senate, and be known as appointive members. During his term of membership on the committee, no appointive member shall engage in any other business, vocation, or employment. Each appointive member of the committee shall receive a salary at the rate of $—— a year and shall hold office for a term of 6 years, except that (1) any such member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed, shall be appointed for the remainder of such term; and (2) the terms of office of the appointive members first taking office after the date of the enactment of this act shall expire, as designated by the President at the time of appointment, one at the end of 2 years, one at the end of 4 years, and one at the end of 6 years, after the date of the enactment of this act. The President shall designate one of the members as the chairman of the committee.

SEC. 2. (a) In addition to the functions and duties prescribed by the Executive order of June 7, 1935, the committee shall perform the duties imposed upon it by this act and shall make such rules and regulations as may be necessary for carrying out its provisions.

(b) The committee is authorized to appoint and fix the compensation of such officers and employees, and to make such expenditures, as may be necessary for carrying out its functions under this Act. Appointments of attorneys and experts may be made without regard to the civil-service laws.

(c) The committee shall make a full report to Congress at the beginning of each regular session of the administration of the functions with which it is charged.

COOPERATION WITH STATE AGENCIES

SEC. 3. (a) The committee shall cooperate with agencies of the several States authorized or designated by State law to deal with water pollution, with a view to—

(1) Coordinating the activities of the several States relating to the prevention and abatement of water pollution;

(2) Encouraging the enactment of uniform State laws relating to water pollution;

(3) Encouraging compacts between the several States for the prevention and abatement of water pollution; and

(4) Making such studies, surveys, and experiments as may be necessary to determine the need for, and to devise methods for carrying out, preventive and corrective measures relating to water pollution in the several States.

(b) For the purposes of this section the Committee is authorized—

(1) To collect and disseminate information;

(2) To make available to State agencies the results of surveys, studies, and experiments conducted by it and by other agencies, public and private;

(3) To assign experts in its employ or, with the approval of the head of the department or agency concerned, in the employ of any other department or agency of the Government, to assist and advise State agencies without charge to such State agencies;

(4) To make or arrange loans for the construction of sewage disposal plants or works for the treatment of trade wastes, as hereinafter provided;

(5) To furnish such other assistance to State agencies as may be authorized by law.

INTERSTATE COMPACTS

SEC. 4. The consent of Congress is hereby given to any two or more States to enter into agreements or compacts, not in conflict with any law of the United States, for cooperative effort and mutual assistance for the prevention and abatement of water pollution and the enforcement of their respective laws relating thereto, and to establish such agencies, joint or otherwise, as they may deem desirable for making effective such agreements and compacts.

STUDIES AND SURVEYS

SEC. 5. The Committee shall make or cause to be made such studies, surveys, and experiments relating to water pollution and its prevention and abatement as it deems necessary. Insofar as practicable in making such studies, surveys,

and experiments, the Committee shall make use of information gained from any similar studies, surveys, or experiments which are available to the Committee, and, with the consent of the head of the department or agency concerned, shall designate employees of any other department or agency of the United States to perform functions in connection therewith.

Substitute for Sec. 6 (a), Page 3:

ESTABLISHMENT OF SANITARY WATER DISTRICTS

SEC. 6. (a) In order to effectively prevent or abate the discharge or deposit of any waste or other harmful substance into the navigable waters of the United States or into any stream from which the same may float or be washed into such navigable waters in any area comprising the watershed thereof which is not wholly contained within the boundaries of one State, the committee shall establish, as speedily as possible, such area as a Sanitary Water District and shall define the boundaries thereof.

(b) The Committee shall fix standards of purity for the waters of each such District, shall establish minimum requirements as to the treatment of polluting material before it is discharged into such waters, and shall promulgate regulations governing the discharge of any matter or materials into such waters.

DISTRICT BOARDS

SEC. 7. (a) In each Sanitary Water District there shall be a district board. The number of members of each such board and the method of selection or appointment, terms of office, and compensation of such members shall be fixed by the Committee in its discretion, except that not less than three-fourths of the members of each district board shall be bona fide residents of the District and shall be apportioned among the States comprising such District as nearly equally as may be.

(b) It shall be the duty of each district board—

(1) To prevent the pollution of waters within the District by voluntary methods insofar as practicable.

(2) To investigate the desirability of making loans or grants in such District for the construction of sewage disposal plants and works for the treatment of trade wastes and to recommend the making of such loans or grants to the Committee.

(3) To institute proceedings for the prevention and abatement of water pollution in such district.

LOANS AND GRANTS

SEC. 8. The committee is authorized to make loans or grants, or both, to States and political subdivisions and municipalities thereof, and to make loans to persons or corporations for the construction, enlargement, or improvement of sewage disposal plants and plants or works for the treatment of trade wastes. Such loans and grants shall be made upon such terms and conditions as the committee shall prescribe, subject to the following limitations;

(1) Loans or grants shall be made only upon the request or recommendation of a State agency or the district board of a Sanitary Water District.

(2) No grant shall be made in respect to any project of an amount in excess of per centum of the cost of the labor and materials employed upon such project.

INJUNCTION PROCEEDINGS FOR THE ABATEMENT OF POLLUTION

SEC. 9. The discharge or deposit of any waste or other substance, whether in a solid or liquid or gaseous state, into any of the navigable waters of the United States, or into any stream from which the same may float or be washed into any of such navigable waters, in violation of regulations promulgated by the committee, if such waste or other substance is or may be injurious to public health, domestic animals or poultry, fish or its environment or shellfish, migratory waterfowl, or other wild game, or impairs in any manner the utility of such waters for navigation purposes, is declared to be against the public policy of the United States and declared to be a public and common nuisance. An action in equity to prevent or abate any such nuisance may be brought in the name of the United States by any

United States attorney, and it shall be the duty of such attorneys to bring such an action when requested to do so by the National Resources Committee or the district board of a Sanitary Water District. Such action shall be brought as an action in equity and may be brought in any court of the United States having jurisdiction to hear and determine equity cases.

MISCELLANEOUS

SEC. 10. Nothing contained in this Act shall be construed to limit in any manner the rights of any person or public body to bring actions for damages on account of the pollution of any waters or for the abatement of such pollution.

SEC. 11. There is hereby authorized to be appropriated, out of any money in the Treasury not otherwise appropriated, such sums as may be necessary to carry out the provisions and purposes of this Act.

SEC. 12. This Act may be cited as the "Water Pollution Act."

DISCUSSION

Dr. EMMALINE MOORE (New York Conservation Dept., Albany). I call your attention to Sec. 9 under Injunction Proceedings for the Abatement of Pollution, about half way down the page, reading:

If such waste or other substance is or may be injurious to public health, domestic animals or poultry, fish or shellfish—

there is a great deal of difficulty in establishing just what is injurious to fish life in all of our court cases.

Mr. LADNER. What do you suggest?

Dr. MOORE. Could we not include "fish or its environment"?

Mr. LADNER. Why not use the term "aquatic life"?

Dr. CARL L. HUBBS (University of Michigan, Ann Arbor, Mich.). I move that the proposed act be amended to use the words: "Fish or its environment."

(Unanimously carried. These words were inserted in the copy of the proposed act.)

KENNETH A. REID, Pennsylvania. I am in accord with this, but am afraid if we bring in environment it may open up a bitter fight. It seems that "fish and aquatic life" would cover this point. At least five Congressmen said yesterday that they thought Congress was without power to handle such matters as dumping pollution in creeks.

Mr. LADNER. My experience shows that no one has successfully enacted the Deposit of Rubbish Act of 1899. The test is whether or not pollution floats or is washed into navigable streams. Oil pollution affects navigation when carried into navigable portion of a stream. That is within the power of Congress to protect navigable waters. We will have to meet this question on the floor of Congress. It seems that the answer is that if we have the right to stop pollution in navigable streams we must necessarily have the right to stop it at the source where it comes into navigable streams.

This act does not go so far as to set a standard that would be injurious to those different things. Unless it affects any one of those, the National Resources Committee could not draft regulation. Merely limitation, not authorization.

The CHAIRMAN. Are there any more questions on this subject?

I think we should make a motion to endorse the text in this bill.

(Moved and seconded.)

It has been moved and seconded that we endorse this proposed bill and that the general convention be requested to adopt it also. Those in favor indicate by the usual sign.

The approval of this motion was unanimous.

Effects of Pollution on Fish

(By M. M. Ellis, Ph. D., U. S. Bureau of Fisheries, Columbia, Mo.)

The changes in a stream incident to pollution from uncontrolled soil erosion and through the introduction of municipal and industrial wastes tend to reduce the fish fauna of that stream both by indirect effects acting through the aquatic complex and by direct effects on the fish themselves. Among the indirect effects may be enumerated the destruction of plankton organisms on which young fish feed, the production of unfavorable conditions at the bottom where food animals such as insect larvae and worms are normally abundant, the blanketing of spawning grounds, and the alteration of the quantities of dissolved gases, salts, and other substances in the water. The direct effects of pollution on fish, for convenience, may be discussed in groups according to the time at which the pollutant actually kills the fish.

In some types of stream pollution fish in particular, and other aquatic organisms as well, are overwhelmed almost immediately by the pollutant because of its high concentration, great bulk, or physical state. If a large quantity of boiling water be suddenly discharged from an industrial plant into a small stream during the course of boiler cleaning, cooked fish near the outlet are the result. Similarly, large volumes of heavy salt liquor, such as the waste from certain bromine plants, if allowed to run rapidly and without agitation into a river, may fill the hollows and depressions in the stream bed for some distance below the source of this effluent. Before diffusion currents in the stream can dilute this heavy salt liquor to a concentration tolerated by aquatic life, the fish in the deeper parts of the stream will be killed through the dehydration and coagulation of the exposed surfaces and membranes because of the high osmotic tension of this salt solution. The great masses of mine slimes which are flumed intermittently into some streams and which can change the clear water of a mountain stream into thin mud in the course of a few minutes constitute another example of this group of pollutants. Such cases of stream pollution, while not unusual, are in the nature of catastrophes so that this group of pollutants need little comment here.

In a second group may be placed a few pollutants which because of their high toxicity and ready penetration into the tissues of the fish kill quickly even in very high dilutions. Substances of this group are not numerous in the ordinary industrial wastes but when found in polluted waters present grave hazards to fish life. Two examples will suffice. Many types of crude oil carry certain highly volatile compounds which are very toxic to fish because of the anesthetic properties of very small quantities of these substances. Fish exposed to very low concentrations of these poisons recovered from

B4744M

A, Gone forever! This last heath-hen ended its journey to extinction on Marthas Vineyard, Mass. Though reported dead many times, it reappeared each spring, but failed to reappear in 1933. (Photo by Dr. A. O. Gross.)

933

B, Woodchuck at entrance to its home on the Seney Migratory Waterfowl Refuge, Mich. (Biological Survey photo.)

934

A, Marshes on Seney Migratory Waterfowl Refuge, Mich. (Biological Survey photo.)

917

B, Eleven young mallards swimming in the Seney marshes. (Biological Survey photo.)

crude oil are anesthetized in a few minutes and all gill movements cease if the fish are allowed to remain in such polluted waters another 15 minutes or less; that is, these oil derivatives which are readily taken up by the tissues of the fish kill just as an overdose of any other anesthetic would kill either fish or higher animals, by stopping respiration and heart action. Again some of the ammonium compounds which are readily absorbed by fishes may produce death very rapidly by direct action on the nervous system without injury either to the gill membranes or the alimentary canal. However, in general, the actions of a large number of the 40 or more types of industrial and municipal effluents which have been assayed and tested at the Columbia (Mo.) laboratories do not fall in this group which includes only those highly toxic substances which are quickly absorbed by the fish.

These bio-assays of the various effluents on living fish under controlled conditions comparable to those found in natural streams showed a high mortality during the first 48 hours if the concentrations of the effluent were sufficiently high; that is, strong concentrations of acid, the salts of heavy metals, sulphur-lime wastes, and many other substances killed fish rapidly during the first 48 hours. If, however, the concentrations of these substances were reduced to dilutions in which the fish did not die during the first 48 hours, a much longer survival was the rule, and the fish usually lived in such polluted waters from 4 to 10 days or longer.

Examinations of individual fish dying during this first 48-hour period revealed that the lining of the mouth, the gills, and the outer coat of the body were, as might be expected, the parts most affected by the action of the effluent. From experimental tests, it was noted that most of the common pollutants are not readily absorbed through the lining of the mouth and the gills. These membranes, as has been established by the researches of various workers, are concerned particularly with the transmission of oxygen, carbon dioxide, and water, and with the excretion of certain salts. Microscopical and histological examinations showed that in the stronger concentrations of many stream pollutants the gill membranes were injured directly; that large quantities of mucous had matted the gill filaments together (in the case of metallic salts this mucous had even been precipitated on the gills and the lining of the mouth; and that there had been a stoppage of blood in the small capillaries of the gills. These conditions, excepting the precipitation of the mucous, were closely paralleled in fish dying of asphyxia in unpolluted water carrying very little dissolved oxygen. In such asphyxiated fish stasis of the blood in the gills was regularly observed at the time when the fish floated helplessly on the surface as if dead, although on opening the body of the fish at this time the heart was found to be beating. The particular type of circulation through the gills of fishes, in which the blood enters very small vessels and subsequently, without returning to the heart, flows directly into the larger vessels which carry the purified blood to the organs of the body, renders the circulation through the gills a particularly vulnerable part of the vital activities of the fish, because a relatively small amount of damage to

the gills can result in complete stoppage of the blood in them. This fact is only too well known to students of the physiology of fish circulation. Many of the stronger effluents, therefore, which killed fish during the first 48 hours produced asphyxia through a combination of factors, namely, by coating the gills with masses of mucous, so that the gill filaments were no longer bathed freely by the water which normally aerated them; by actual damage to the cells of the gill membranes themselves, which impaired their function and rendered them less permeable to dissolved oxygen; and, finally, through damage to the gill filaments, which progressively created more and more pronounced stasis in the blood vessels of the gills. This third group of pollutants, on the basis of their lethal action, includes the stronger concentrations of a large proportion of the common industrial effluents.

If the effluents are diluted so that they do not damage the gills, producing death by asphyxia within the first 48 hours, another set of factors usually comes into play in this sequence of detrimental action on the fish of the toxic materials in polluted waters, defining a fourth group of pollutants. Fresh-water fishes as well as land animals require water for the maintenance of their body activities, and the common portals of entry for water into the body of the fish are the linings of the mouth, the gills, and the alimentary canal. Most fresh-water fishes, as has been found by many observers and confirmed by our own work, refuse to swallow disagreeable or irritating substances. Consequently these fish do not swallow when first placed in water containing many types of effluents, even though the effluent be very dilute. In many cases fish will refuse to take food for a time in such polluted waters, as the swallowing of food would involve some of the polluted water. If the effluent is not strong enough to kill by asphyxia, as described above, and yet is strong enough to stimulate this antiswallowing reaction, the fish may live for many hours in such polluted water without apparent discomfort. However, in most of the fresh-water fishes the water intake through the linings of the mouth and the gills combined is not adequate to meet the needs of these fishes; and after 48 hours, judging from dye tests on stomach contents, the individual fish will begin swallowing polluted water, regardless of the anti-swallowing reaction. This procedure then brings the toxic and detrimental substances in the polluted waters in contact with a new set of membranes—that is, those lining the alimentary canal—and death will usually follow in a matter of days if toxic substances be present in sufficient quantities to damage the lining of the alimentary canal so that its normal functions of water absorption and food digestion and absorption are interfered with.

If the pollutant be so dilute or of such a nature that the fish escape the damage to the lining of the alimentary canal after the polluted water has been swallowed, many pollutants present still another hazard, which may ultimately kill the fish, namely, the cumulative action on various parts of the body of small quantities of toxic substances absorbed from the polluted water by way of the alimentary canal. This type of poisoning and death which characterizes the action of the fifth group of pollutants can occur as the result of the

presence of various pollutants such as arsenic and selenium in high dilutions. Pollutants of this group present difficult problems in the determination of stream-pollution hazards, since these substances in high dilution seem relatively innocuous at the time because the reactions of fish which may survive such pollution for many days are not suggestive, for a time, at least, of either discomfort or injury.

Other very dilute pollutants which do not accumulate in the tissues comprising a sixth group produce minute lesions on gills, mouth membranes, body surface, and fins. These small injuries, which may not be serious in themselves, form favorable sites for infections by water molds and bacteria. Such lesions and those produced by shorter exposures to stronger concentrations of certain pollutants may be demonstrated nicely by the use of intravitam dyes and other staining methods long before any major injuries or damage to the fish are apparent.

The findings which have been discussed indicate the importance in connection with the maintenance of desirable fish faunae in our streams, of adequate dilution of waste substances, if these effluents are to be allowed access to the streams at all. Not only is the absolute dilution to which a given stream will reduce a given quantity of effluent important, but the concentration of this effluent when it first enters the stream as well. Many wastes which when sufficiently diluted are relatively harmless, if encountered by the fish in higher concentrations will provoke the cycle of changes leading to asphyxia described in group three. Besides, the dilution of the effluent by the stream should be rapid enough to lower speedily the concentration below the level producing the alimentary disturbances discussed in group four, and cumulative poisons of all sorts should be excluded entirely.

In conclusion it may be stated that these physiological and pharmacological studies of various pollutants have brought out the facts, that the detrimental actions of any given effluent are functions of the dilution in which that effluent reaches the fish, and that high dilutions which may seem to be harmless over short periods may produce disastrous results through cumulative action.

DISCUSSION

Dr. Emmaline Moore (New York Conservation Department, Albany, N. Y.). I would like to ask Dr. Ellis further in regard to the effect of a small pollution in the case of sewage pollution. Do you mean that a small pollution can be very toxic?

Dr. Ellis. The particular case can be administered on its own merits.

Dr. Moore. What are the circumstances that give you those highly toxic sulphides?

Dr. Ellis. Much more severe in slow water. Erosion silt has to be handled as well. Physical conditions may be an important factor. Local conditions must be considered.

Dr. Moore. A great many people are incorrect in arguing that a small amount of pollution with sufficient dilution may be all right.

Pollution of Streams From Pulp and Paper Mills

(By C. E. Curran, principal chemist in charge, section of pulp and paper, Forest Products Laboratory,[1] Forest Service, U. S. Department of Agriculture)

Fiber wastes and chemical wastes constitute the chief sources of stream pollution from pulp and paper mills. Fiber wastes are derived from the so-called "white waters", which are fiber-bearing wastes resulting from the washing and screening of mechanical or chemical pulps or from the paper machines. Chemical wastes are contained in the waste liquors that are drained or washed from chemical pulps in process of production.

Generally speaking, "white water" wastes are not toxic but are objectionable because they carry insoluble components subject to a certain amount of decomposition. The fibers in the "white water" eventually deposit a blanket of imponderable material on the stream bed, which inhibits a normal growth of aquatic plant or animal life. In addition to fibers, the "white waters" contain varying quantities of clay or other filler, organic dyestuffs, alum, and other chemical reagents.

The fiber in "white water" has a reuse value that is fully recognized by the pulp and paper industry, and very definite progress has been made in controlling this source of pollution. So-called "save all" equipment has been developed to a high degree of efficiency and "closed systems" of operation, in which the "white water" is reused for beater make-up and for machine showers, have been introduced by many mills.

This "white water" reuse process has been very effective in reducing the pollution of streams from the fiber. A decade ago it was estimated that between 7 and 10 percent of all the fiber consumed by the pulp and paper industry was lost in the mill waters, whereas recent estimates indicate an average figure of between 3 and 4 percent, or a reduction of pollution from this source of approximately 50 percent. The American Paper and Pulp Association has been active in conducting educational work and engineering service directed toward the elimination of this type of pollution by pulp and paper mills.

Pollution from the chemical pulping processes, though it has received much attention, is in a less satisfactory state. In the case of mechanical pulp, where no chemical is employed, the same methods of recovery and reuse are applicable as in "white water" recovery from the paper mills.

The alkaline pulping processes, such as the sulphate process used for the manufacture of strong kraft wrapping papers and boards, and the soda process, such as used for the production of book and magazine papers, have never been considered a serious pollution problem. The bulk of the waste liquors from the alkaline pulping process is recovered, concentrated, and the alkali reused in the process. A certain amount of alkali-bearing wash water goes to the streams. This, however, consists of the tailings and very dilute alkaline wash liquors which contain so little reagent as to make their recovery unprofitable. No serious effects have been attributed to such waste waters if the recovery operation is functioning properly. There are occasions, how-

[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

ever, when, through accident, an excess of alkali is sent to the sewers, which may have a deleterious influence upon the aquatic life in the stream adjacent to the mill.

In sulphate pulping operations there is another component, termed "mercaptans", that occasionally gets into the waste waters. Mercaptans are the sulphur ethers or alcohols that are formed in the cooking process. They have a very disagreeable odor, and the State Board of Health of Wisconsin has found them to be toxic to fish life if present in water to any appreciable extent. The quantity of mercaptans formed is small, and it is only under exceptional conditions that their effect seems to be serious. The Wisconsin work shows that concentrations greater than about one part per million are serious, as beyond this concentration the nervous system of fish is seriously impaired and death eventually results.

Another source of pollution from both sulphate and soda pulp mills is the lime used in the causticizing of the recovered liquor. The sodium carbonate in this liquor is converted to caustic soda by treatment with calcium hydroxide with a precipitation of calcium carbonate. This precipitate is filtered off and if run into the stream forms a calcareous deposit for some miles down the stream bed. However, the pulp mills have recognized this potential pollution, and in most mills the lime is either reburned for reuse in the recovery process or is dumped at some point where it will not get into the stream excepting in very small quantities. This lime has value as a fertilizer and is frequently either sold or given away to farmers for agricultural use. In one or two mills the lime is converted to whiting.

The principal offender from a stream-pollution standpoint is the acid sulphite process. In this process sulphurous acid and bisulphite of lime are employed. The action on the wood is reducing in nature and results in the formation of the calcium salts of lignin sulphonic acids. This action produces a waste liquor, which is very reactive toward oxygen and will combine with oxygen from any available source, such as is present in the stream into which it may be discharged. It will also impart to such waters an acidic condition and possibly introduce compounds of a toxic character, such as the lignin salts, which may exert extremely harmful influences on aquatic life.

The injurious effects of waste sulphite liquor have long been recognized by the industry and a determined effort has been made to solve this problem. Nearly every research staff in the industry has had a try at it, and, in view of the complexity of the problem, it has become almost a standing joke within the industry that every new research laboratory set up by either public or private interests to study pulp- and paper-mill problems places this project of waste sulphite-liquor utilization first in its program. In the early days the efforts were directed principally toward development of useful byproducts which might offset recovery costs, and many such products have been produced. The literature shows that waste sulphite liquor finds a use as an adhesive for many purposes, as fertilizer, as a source of sugar from which alcohol can be manufactured, as the base of certain dyestuffs, as tanning agents, and as an "ausgang" substance for the production of various organic chemicals. None of these products, however, can be absorbed industrially in very large amount, and in many instances their production from waste sulphite liquor is not

economic because of other cheaper sources. A good example is the case of road binders, which are also easily and cheaply produced from coal tar from the coking industry.

However, some limited progress in utilization has been successful. Some years ago the West Virginia Pulp & Paper Co. perfected the so-called Robeson process in which the liquors are neutralized with lime and are concentrated in evaporators, the concentrate being employed for adhesive purposes, including road binding. At the present time one western mill disposes of practically all its sulphite liquor waste for road-binding purposes, this material being used in the eastern part of Oregon and Washington, where the rainfall is so light that one application of the material is sufficient for a season. In areas where the rainfall is greater, the soluble characteristics of the acid liquor militate against such use. The use of waste sulphite liquors in the manufacture of ethyl alcohol, used for motor fuel, is common practice in Europe, but cannot compete with the cheap gasoline of the United States. In the production of tanning agents, dyestuffs, and organic chemical compounds, the output from any one mill would quickly saturate the market.

For the foregoing reasons attention has been directed in recent years toward some means of utilizing the waste liquor within the mill of its origin, either as fuel or in the recovery of chemicals for reuse in the production process. Excellent progress has been made in this connection, although many problems still remain to be solved.

An outstanding development has been made in the past few years at the mill of the Marathon Paper Co., Rothschild, Wis., where the Howard process of waste sulphite liquor recovery has been operating on a pilot-plant scale. This process is one of precipitation. (1) The waste liquors from the blow pits are treated with a precipitant under carefully controlled conditions with a resulting deposition of calcium sulphite. This product goes back to the acid plant of the mill where it is used in the production of bisulphite of lime and reused in cooking. (2) The filtrate from the first step is treated with lime which precipitates a large percentage of the lignin—presumably as lignin sulphonic acid residues. These residues are dried and sent back to the boiler plant for use as fuel. (3) A third stripping action on the filtrate from step (2) provides the material used as a precipitant in the first step.

The economics of the process depend primarily on the pulp mill costs for fuel, lime, and sulphur, and these items, particularly fuel, vary considerably with the geographic location of the pulp mill. Mr. Howard states that under average Wisconsin pulp-mill conditions the process should show some profit on its operation from the value of products recovered for acid making and for fuel, exclusive of making the special products, such as tanning agents, lignin plastics, and organic chemicals which he has developed but for which the market is insufficient to be available to every pulp mill.

The only apparent disadvantage of the Howard process at the present time is the fact that there still remain from the final precipitation, some tailings that have a biological oxygen demand. This demand is about one-sixth of the original value but still might be objectionable in some instances. There is no question, however, that the Howard process is an excellent forward step toward the goal of waste sulphite liquor recovery and use.

Recently also there have been several proposals to evaporate and burn waste sulphite liquor. These proposals are made practicable by virtue of the development of acid-resistant chrome-nickel steels and of high-velocity evaporation equipment, which presumably eliminate scale formation. The return is in the form of waste heat, which can be used for both process steam and mill operation. Thus far no commercial developments have been successful in which this principle was employed. A few years ago such a scheme was tried at Floriston, Calif., at the mill of the Crown Willamette Paper Co. Experimental work on this project utilized a small high-velocity evaporator and the results were very promising. When the mill installation was made, however, the velocity of evaporation was reduced, and considerable scaling of the equipment resulted, quickly closing the operation. At least two new systems are being advocated now following this same principle, both of which seem to be based on sound engineering and to have potentialities of success.

One difficulty in the evaporation of ordinary waste sulphite liquor is the presence of insoluble calcium salts, which tend to form scale and quickly clog up the evaporator tubes. The Forest Products Laboratory has sought to eliminate this difficulty by utilizing in the sulphite process a sodium salt rather than a lime salt. Such sodium salts are soluble and can be evaporated with a minimum danger of scale.

The chief objection to this process, however, is the high cost of the sodium, which necessitates a recovery system to make available the reagent for reuse. If recovery is necessary, it, of course, automatically eliminates pollution, but at the same time the higher operating costs are likely to put the soda-base process at a disadvantage with the ordinary lime-cook operation.

A thorough investigation has shown that soda-base liquors have certain slight advantages over lime-base liquors in the yield of pulp, in the quality of the product, in the bleach requirement necessary to produce a white pulp, and in the fact that soda-base liquors are applicable to more resinous wood species than are the lime-base liquors. These advantages, however, are not sufficient to justify the extra cost that would be involved unless recovery of the liquors can be accomplished. Therefore a systematic study of evaporation and burning of these liquors has been made in which it has been found that the best results are secured by conducting the burning under reducing conditions and the forming of sodium sulphide just as is done in the standard sulphate pulp-recovery process.

Use of this reducing reaction eliminates the formation of thiosulphates, which have been found injurious in the subsequent pulping reaction. The principal problem has therefore been one of changing sodium sulphide back to sodium bisulphite, which is the active component of the cooking liquor.

This conversion is accomplished by treatment of the sulphide with sodium bicarbonate, which is a byproduct of a later sulphiting reaction. The steps can be outlined in this way. (1) The moist sodium sulphide ash is treated with sodium bicarbonate and under the proper conditions is converted to sodium carbonate and sulphur. The sulphur is utilized in the acid-burning system of the plant. (2) The sodium carbonate is then treated with sulphur dioxide from the acid plant, whereupon there is formed sodium bisulphite and carbon dioxide. (3) This excess of carbon dioxide is combined with some

of the sodium carbonate resulting from the above-described reaction and converted into sodium bicarbonate, which is utilized in the first step of the foregoing reaction.

The advantage of the recovery and burning processes for waste sulphite liquor is that no waste other than very dilute wash waters from the blowpits gets into the stream. All of the oxygen consuming components are utilized back in the system.

It should be pointed out, however, that all these developments are in a strictly experimental state. To be sure the Howard Process is now going into plant-scale operation, but the other methods still require demonstration and their merit needs to be proved. Ninety-nine out of every hundred sulphite mills in the United States, if faced tomorrow with the alternative of ceasing pollution or ceasing operation, would be forced to take the latter. The methods to alleviate pollution from sulphite mills are bound to be very expensive. Any one of the methods previously outlined will call for an investment of at least $1,000 per ton of daily pulp capacity. Most mills would be willing to assume this capital charge if they were certain that the processes recommended would work. No one can give them this assurance. What is needed is encouragement on both the part of public and private agencies to demonstrate how practicable the available methods are. Full-scale operations of the various proposed methods are needed over a period long enough to definitely establish their feasibility.

(No discussion.)

The Federal Part in Pollution—An Analysis of the Report of the Special Advisory Committee on Water Pollution, National Resources Committee

(By P. G. Platt, member, Sanitary Water Board, National Director and Honorary President of Pennsylvania Division, Izaak Walton League of America)

The long-awaited report of the special committee appointed to draft a plan for Federal participation in the eradication of water pollution is at hand. The report is an outgrowth of, or rather an offshoot from, the Dern-Lonergan conference, and contains much food for thought. It contains many statements of fact which cannot be denied. Its conclusions and proposals are, in the main, contradictory to the statements of fact concerning existing conditions and efficient methods of correction.

The first paragraph of the introduction to this document inspires great hopes in stating that the water planning committee of the National Resources Board concluded (1)—

> That the problems of stream pollution by industrial waste and municipal sewage are outstripping the best efforts of those whose function it is to effect an economical and rational balance between sensible regulation and industrial expansion.

Paragraph (3) then states:

> That control of stream pollution is generally and logically a function of State government, and in most States existing legal authority to limit the degree of water pollution must be exercised with rare judgment to prevent curtailment of industry which might produce undesirable social and economical consequences.

Conclusion (1) is self-evident; (3), however, nullifies the well-worded preceding paragraph. It is true that attempts at control of pollution in the past have been an exclusive function of States; yet this precedent should not be considered cause to continue a policy which has been proven to be a failure.

Watercourses are by their very nature interstate. They never can be confined to man-made political boundaries. As "Ken" Reid so ably stated in the Dern-Lonergan conference:

> There are many points of similarity between an interstate transportation system and an interstate river system, and Federal regulation is just as necessary for properly handling the pollution of the latter as it is for controlling the commerce of the former. Both are interstate transporation systems, but the river runs only one way and collects all the freight on its pollution cargo from the down-river communities and industries that must use its water.

All water gravitates to the sea, and in so doing becomes a matter of Federal concern.

The present status of Federal jurisdiction over water pollution is almost exclusively investigatory. It has power to order abatement of discharge of solids into navigable waters where such discharge interferes with navigation. There is also some power to control discharge of oil in waters where the tide ebbs and flows. The Public Health Service is essentially a research organization which concerns itself chiefly with standards of drinking water. Beyond this, the Federal Government is impotent in matters relating to pollution, and it was with this thought in mind that the Dern-Lonergan conference was called. The report goes on to mention that the States themselves do not favor broad Federal jurisdiction over the pollution evil. It is only natural to expect that State agencies would be disinclined to admit their impotence in dealing with the problem. Unless the Federal Government has definite jurisdiction over the pollution problem we can never expect any degree of uniformity in State legislation, no matter how sincere these States might be in their efforts.

The report indicates that 14 State laws afford no control over pollution whatever; 26 afford partial or ineffective control, while 8 States "appear to permit a maximum degree of control." Without definite Federal jurisdiction, industry of the first two groups will not soon, if ever, permit adoption of laws which would tend to lessen its present competitive advantage over those who are required to live up to certain standards of decency and obligation toward the public. In many States, existing laws specifically exempt certain industries, municipalities, areas, or rivers. In many cases, phrasing of State laws is so vague as to make them inoperative. In other cases, there is lack of mandatory powers of enforcement, while one of the most common faults is the lack of financial appropriation to the administrative agency. A table showing State funds available for stream pollution control is most illuminating. Of the 41 States reporting on the subject, 4 report no funds whatever; 10 report no specific funds available, while the 2 States in the highest bracket, with appropriations of $100,000 to $150,000, mean only a yearly per capita expenditure of 2.7 cents, based on urban population. A fair average for all States would appear to be considerably less than one-half of 1 percent per capita per annum, based only on urban popula-

tion. It must also be borne in mind that these appropriations are interwoven with other phases of sanitation, so that only a minor fraction is used in actual control of water pollution.

The data obtained suggest that in most States neither the present personnel nor the funds available are adequate for the proper and efficient administration of water-pollution control.

One of the greatest stumbling blocks in the path of the disposal of municipal sewage is the statutory limitation on bonding and taxing powers of municipalities. In order that an orderly and uniform plan of progress can be consummated with regard to the problem of municipal sewage, it would seem essential that this last recommendation be wholeheartedly accepted. In the meantime, it is to be hoped that the various initialed agencies for dispensing Federal funds will adopt a policy whereby no municipality will be allocated any funds whatsoever except for sewage collection and treatment, until such obligation has been fulfilled.

Considerable reference is made to the establishment of "standards of water quality." Conservationists will generally be opposed to any attempt to set standard short of purity. The ultimate standard of quality is that of common law, viz: "Unimpaired in quality and undiminished in quantity." It is inconceivable that any form of legislation or administration would produce this idealistic condition immediately, yet it is a goal which should ever be in mind. In the meantime, let us not permit the adoption of laws or standards which would tend to legalize any form of pollution.

Referring to water pollution from a biological consideration, the report states:

In addition to the direct influence of water pollution on aquatic life, waterfowl, and various other forms of wildlife, there are resultant economic and social losses of great complexity. The role of water in these social and economic changes is difficult to evaluate.

In dealing with existing State antipollution laws, the report states that even where such laws and administrative personnel appear adequate, they are not producing satisfactory results. "The basic causes of lack of progress lie in public apathy and in the cost of remedial measures." And now for a statement with which all conservationists will agree:

It is needed to bring about a public realization of the fact that clean streams represent an economic value to the community which would more than effect the cost of the necessary treatment works.

As a result of the Dern-Lonergan conference, two proposals were presented by the committee. One advocated direct Federal control of the pollution problem, setting up an agency with power to finance and police a definite plan of water purification and use on a national basis. The second proposal advocated coordination of existing State laws and formation of State compacts and agreements. Under this plan, the Federal Government would act only in an advisory capacity in enforcement, but would assist somewhat in financing. The conference, by a substantial margin, voted for direct Federal control.

The report of the National Resources Committee indicates that in practically every case where interstate negotiations, agreements, compacts, etc., have been consummated, the result has been unsatisfac-

tory. In every case the parties to the agreement try to get the best of the bargain, with the result that negotiations are drawn out for years; there is nothing permanent in the final agreement, and one State invariably gets the best of the bargain at the expense of the others.

In spite of above findings, together with the vote of the previous conference, the National Resources Committee Report now advocates the State compact plan. The final recommendation of the Committee is that no move be made to strengthen Federal antipollution laws, but that the Potomac River drainage basin be made an outdoor laboratory to demonstrate what can be accomplished by means of negotiations and active cooperation between the four States affected, viz: Maryland, Virginia, West Virginia, and Pennsylvania. It is suggested that administration of the project be placed in the hands of a committee of five members, one from each of the four States mentioned, the fifth to be a representative of the National Resources Committee. Estimated cost of the project, including all forms of domestic and industrial wastes, research, and administration, is $15,000,000. It must be borne in mind that no appropriation has been made. The document is merely a recommendation that such appropriation be made available. The success of the proposal hinges upon three factors: The personnel of the administrative committee, the securing of appropriations sufficiently large for the purpose, the ability to secure the necessary cooperation of the four States whose effluent effects the drainage basin.

The findings of the special committee's report are so important as to warrant a more constructive recommendation than is the case. The recommendation is more bureaucratic minded than action conscious. It is likely that a real conservation bill, calling for direct Federal control of the pollution problem will be introduced in the present session of Congress. Its sponsor will undoubtedly be Senator Lonergan, of Connecticut, who arranged for the original conference in Washington. Watch for this bill, you conservationists, you who believe in Dr. Theobold Smith's statement that "the American people must destroy water pollution or it will destroy us."

PRACTICAL WILDLIFE MANAGEMENT

Friday Morning, February 7, 1936

Chairman: W. L. McAtee, United States Biological Survey.
Committee: F. C. Edminster, New York State Conservation Department, Albany, N. Y.; L. G. McNamara, New Jersey Board of Game Commissioners.

Permanent Food and Cover for Wildlife in the Northeastern United States

(By N. W. Hosley, Harvard Forest, Petersham, Mass.)

(Preliminary comment: I would like to say that I have confined myself to the Northeast. What little knowledge I have on the behavior of these various plants is limited to the Northeast, and the main part of my observations have been in Michigan and Massachusetts.)

The improvement of the environment as a means of increasing wildlife is given by Leopold (5) as the last step in the sequence of measures used in any region. It is only during the last two decades that anything has been done with songbirds along that line in this country, and only during a much shorter time has anything been done for the environment of game species.

Although annual food patches have a very definite and valuable place in wildlife management, for some uses plantings with woody species have many advantages over those made with herbaceous materials. Many of the woody plants produce a large volume of food material per unit of ground area; they are especially valuable in erosion control; they require little care, and, what is most important, persist for years. Many woody species have a high ornamental value, and the conifers are, of course, the best group of cover plants.

Permanent plantings have many uses in wildlife work. In areas where clean farming is the rule and where woodlots are heavily grazed, they are very useful for both food and cover (3). In sections which are forested but which lack food, they are equally valuable. Where hardwoods cover large areas and winter protection is needed, coniferous plantings provide this and, at the same time, can be made to produce timber or Christmas trees. These permanent plantings can be made to serve as very effective escape covers in regions of heavy hunting. They are also favored nesting sites for both song and game birds, especially in farming areas. With the pheasant they also help to provide more crowing territories and hence increase the potential rate of increase on a given area.

When the question of plant characteristics is raised, there is little information available. Most of the work done on the woody plants

has been either from the standpoint of timber production or of landscape work. With the conifers used in forestry there is fairly good information available on the periods between seed crops, their volume production, and so forth, but with the hardwoods this is practically lacking. The landscape approach in work with the shrubs and trees has been most concerned with colors, sizes, shapes, and soil requirements and, since they are not attractive ornamentals, many of our best food species are not considered. In other words, the information most needed from a wildlife standpoint has yet to be obtained with most species.

Whether a given plant is adapted to use at a particular location depends on a number of things. The first question is whether it will be used by local wildlife. On many of the plants which are apparently ideal, there is no information. It seems dangerous to rely on foreign information as applying to our conditions. As an instance, European literature on shrub planting for wildlife almost universally recommends privet, but the writer has never been able to observe any bird or mammal eating the fruit and has only had records of the cedar waxwing using it. The next consideration is whether or not the plant will be hardy. Winter temperature is the greatest factor in deciding this. Such a textbook as Rehder's Manual of Cultivated Trees and Shrubs gives the zone limiting the northern range of each species and many of its other known characteristics. We must know whether a fruit-bearing plant will afford food when it is most needed by wildlife. In the Northern States the most critical time is, of course, in winter, and there is usually little use in planting a species, the fruit of which is all gone by summer or early fall. Also, a species which holds its fruit well into the winter in one region may lose it by early fall in another, so local information is very necessary. The woodbine holds its fruit well into the winter in southern Michigan, but never seems to do this in Massachusetts. To be of the most value for food, a species must fruit regularly and in sufficient quantity to be important. Whether the fruit decomposes early or, as in the case of some of the hawthorns, remains plump, firm, and bright over winter is another very important point. Competition for the available food increases as winter advances, and a fruit available in late winter or early spring is especially valuable. Many species will grow only on certain types of soil, but little is known about this phase. Some kinds of plants require cultivation of the soil or won't thrive in competition with grass and weeds. Since most of the observations have been made under more or less artificial conditions, we know little about this. Some species, of course, carry diseases or pests that affect agricultural crops. An example of this is the common barberry, which is the alternate host for wheat rust. The closely related Japanese barberry is immune to this rust.

Granted that we can grow a given species of plant, we are usually still in the dark as to the nutritive value of the fruits. We need for many species studies similar to those of Maynard and others on the values of various kinds of browse to deer (6). Generally speaking, the nuts such as the hickories, hazel, beechnut, butternut, and black walnut have a very low water content, about twice the protein content of corn, very high fat, and very low carbohydrate values. The

acorns and chestnuts are much lower in protein and higher in carbohydrate contents. These hard-shelled nuts are, of course, mainly limited to use by the squirrels. The few pulpy fruits on which analyses have been made show a high water content, a protein content similar to that of corn, varying amounts of fat, and carbohydrate contents approximately like corn. The available analyses are not strictly comparable between groups because they come from two sources and the methods of computing percentages are obviously different with the carbohydrates and apparently with water. The following table gives some of the available information on nuts and fruits with that for corn and grasshoppers given for comparison.

TABLE I.—*Chemical composition of some fruits and nuts with corn and grasshoppers for comparison*

Material	Approximate percent composition				
	Water	Protein	Fat	Carbohydrates	Nitrogen free extract
Late apples	83.6	0.3	0.3	15.5	----------
Blackberry	85.3	1.2	1.1	11.9	----------
Blueberry	83.4	.6	.6	15.1	----------
Crab apples	81.1	.4	.3	17.8	----------
Hawthorn	75.8	2.0	.6	20.8	----------
Mulberry	82.8	1.2	.6	14.6	----------
Red raspberry	83.4	1.1	.6	(1) 14.4	----------
Chestnut	33.45	10.19	10.20	----------	42.35
Acorns (dry)	2.38	7.07	4.85	----------	80.97
Butternut	4.5	27.9	61.2	----------	3.4
Black walnut	2.5	30.3	57.8	----------	5.8
Hickory nut	3.97	20.5	64.6	----------	6.4
Hazelnut	3.7	15.6	65.3	----------	13.0
Beechnut	4.0	21.9	57.4	----------	13.2
Chokeberry	5.08	8.72	5.17	77.88	----------
Frost grapes	11.63	9.49	4.76	70.13	----------
Nightshade	10.41	13.94	12.53	58.67	----------
Panicled dogwood	3.61	10.11	18.82	64.70	----------
Grasshoppers	1.91	71.27	3.54	19.6	----------
Corn	12.9	9.3	4.3	[1] 74.8	----------

[1] Digestible (10).

These few analyses show that the materials covered are valuable foods for wildlife when considered from the usual standard of chemical make-up.

One of the greatest values of fruits to wildlife is apt to be through the vitamins or other special properties. Little is known about the vitamin requirements of wild animals or of the vitamin contents of any except the domestic fruits. However, from experiments with these it is reasonable to suppose that the other fruits are a good source of vitamin C. This regulates growth, digestion, and condition of the heart and prevents blood disorders and bone brittleness (8). Leopold also suggests that some fruits may be the source of necessary minerals and that others may act as astringents or vermifuges (5).

The use of a plant species as food by wildlife must be taken as an empirical measure of its value. The following table is an attempt to summarize some 52 references on food habits, including such outstanding pieces of work as that of Stoddard on the bobwhite quail, Kelso on the ruffed-grouse foods in the Northeast, the work of the New England Ruffed Grouse Investigation, etc. (4).

Some of the outstanding plants in this list have known characteristics which are very valuable from a wildlife-management standpoint.

The black chokeberry, *Aronia melanocarpa*, usually bears only light crops, but a group growing on a cinder dump in a railway grade and loaded with fruit suggests its use on abandoned roadbeds. It can be propagated by dividing plants or from seed stratified 90 days at 32–41° F.

TABLE II.—*Use of 45 more important northeastern woody plants by wildlife*

["x" indicates known use]

Plant species	Ruffed grouse	Hungarian partridge	Pheasant	Bobwhite quail	Sharp-tailed grouse	Prairie chicken	White-tailed deer	Moose	Snowshoe hare	Cottontail rabbit	Squirrels	Songbirds
Aronia, chokeberry	x	----	x	x	x	x	----	----	----	x	----	x
Berberis Thunbergii, Japanese barberry	x	----	x	x	----	----	----	----	----	x	----	x
Berberis vulgaris, common barberry	x	----	x	----	----	----	----	----	----	x	----	x
Betula lenta, black birch	x	----	----	----	----	----	x	x	----	x	----	----
Betula lutea, yellow birch	x	----	----	----	x	x	x	x	----	x	----	----
Carya, hickory	----	----	----	x	----	----	x	----	----	x	x	----
Celastrus scandens, bittersweet	x	----	x	x	----	----	----	----	----	x	x	x
Cornus, dogwood	x	----	----	x	----	----	----	----	----	----	----	x
Cornus paniculata, panicled dogwood	x	----	x	----	----	----	----	----	----	x	----	x
Corylus, hazel	x	----	x	----	----	x	x	x	x	----	----	x
Crataegus, hawthorn	x	x	x	x	x	----	x	----	----	x	----	x
Elaeagnus argentea, silverberry	----	----	x	----	----	x	----	----	x	----	----	x
Ilex verticillata, black alder	x	----	x	x	----	----	----	----	----	----	----	x
Juglans cinerea, butternut	----	----	----	----	----	----	x	----	----	x	x	----
Juglans nigra, black walnut	----	----	----	----	----	----	----	----	----	----	x	----
Juniperus communis, pasture juniper	----	x	----	----	----	----	x	x	----	----	----	----
Juniperus virginiana, red cedar	----	----	----	x	----	----	----	x	----	x	----	x
Lonicera, honeysuckle	----	----	----	x	----	----	x	x	----	----	----	x
Malus, apple	x	----	x	x	----	----	x	----	x	x	----	x
Myrica, bayberry	x	x	x	x	----	----	x	----	----	----	----	x
Parthenocissus quinquefolia, woodbine	x	----	x	x	----	----	x	----	----	----	----	x
Populus, poplar	x	----	----	----	x	----	x	x	x	x	----	----
Prunus serotina, black cherry	x	----	x	x	x	----	x	----	----	x	x	x
Quercus, oak	x	----	----	----	x	----	----	----	x	----	x	----
Quercus alba, white oak	----	----	x	----	----	----	x	----	----	x	----	----
Quercus borealis, red oak	----	----	----	----	----	----	x	x	----	x	----	----
Rhus, sumach	x	----	----	x	x	----	----	----	----	----	----	x
Rhus copallina, winged sumach	x	----	x	----	----	----	----	----	----	----	----	x
Rhus glabra, smooth sumach	x	x	x	----	----	----	x	----	----	x	----	x
Rhus hirta, staghorn sumach	x	----	----	----	x	----	x	x	----	x	----	x
Robinia pseudoacacia, black locust	----	----	----	x	----	----	x	----	----	x	----	----
Rosa, rose	x	----	x	x	x	x	----	x	x	x	----	----
Rubus aculeatissimus, red raspberry	----	----	x	----	----	----	x	----	----	x	----	x
Rubus allegheniensis, blackberry	x	x	x	x	----	----	x	----	----	x	x	x
Smilax, green brier	x	----	----	x	x	x	----	----	----	x	----	x
Solanum Dulcamara, deadly nightshade	x	----	x	x	----	----	----	----	----	x	----	----
Sorbus, mountain ash	x	----	x	----	x	----	----	----	----	----	----	x
Symphoricarpus racemosus, snowberry	x	x	x	----	x	----	----	----	----	----	----	x
Taxus canadensis, ground hemlock	----	----	----	----	----	----	x	x	----	----	----	----
Thuja occidentalis, white cedar	----	----	----	----	----	----	x	x	x	x	----	----
Tsuga canadensis, hemlock	----	----	----	----	----	----	x	----	x	x	----	----
Vaccinium, blueberry	x	x	x	x	x	----	x	----	----	x	----	x
Viburnum Opulus, highbush cranberry	x	----	x	----	----	----	----	----	----	----	----	x
Vitis, grape	x	x	x	x	----	----	x	----	----	x	----	x

The Japanese barberry bears regularly and heavily and does well on dry soils. It is a valued ornamental on account of its red fruit, which is held until spring. It can be grown from seed sown in the fall or stratified until spring.

The hickories, butternut, black walnut, and oaks require a long period in which to reach bearing age; but once this is reached, the

amount of food produced by a single tree is a real contribution to the welfare of local wildlife. They are grown from seed stratified over winter.

The native bittersweet makes a good cover tangle and produces a fair crop of fruit. The plants are either male or female, but the females produce enough male flowers for fertilization. The oriental bittersweet, *Celastrus articulata*, is more vigorous, bears heavier crops, and holds its fruit longer than the native species. Either species is an attractive ornamental. On account of the sex character, they are best propagated from the female plants by layering. They can also probably be grown from root cuttings.

Of the dogwoods the panicled species seems to be the most promising. It bears well and holds its fruit well in southern Michigan, but doesn't seem to do so in Massachusetts. Its fruits are so eagerly sought by the songbirds that heavy crops disappear some years before frosts come. The plants can be grown from seed or cuttings.

The hazelnuts, *Corylus americana* and *C. rostrata*, are adapted to use as woodland borders or as "filler" in planted groups. Their fruits are attractive human food, the first-named species being larger and easier to husk. The hazels grow well from seed stratified over winter; the plants sucker; they can be easily layered and transplant well.

The hawthorns are an almost endless group as far as species are concerned and are as variable as numerous. At the Arnold Arboretum it seems that species from farther south hold their fruits better than the native ones. Some of the better species for wildlife plantings are *Crataegus monogyna*, *C. oxyacantha* and, as far north as southern Michigan, central New York, and central Massachusetts, *C. phaenopyrum*. The seeds of crataegus need afterripening for a year at 41–50° F. The plants transplant well.

The silver-berry is a shrub or small tree with leaves silvery on both surfaces. It does well on poor or dry soils and is especially good for use on lake fronts. It is easily propagated by moving the suckers which develop around old plants.

The black alder is a shrub often found in swamps, but it does well on any upland soil which is moderately cool and moist. It holds its bright red fruits well into the winter and is one of the most striking ornamentals. The species transplants well.

Of the honeysuckles the Maack's or Amur species, *Lonicera Maackii*, shows most promise for wildlife. It is a large, spreading shrub or small tree. Its heavy crops of dark red berries are borne in September or October and persist well into the winter. The plant makes a very good specimen shrub. The Chinese form, *L. Maackii podocarpa*, is freer growing and its fruits persist longer than the type. The seeds germinate well when stratified over winter, and dormant cuttings are successful.

The apple is by far the most widely used woody food species of the Northeast. The many varieties differ widely in hardiness, abundance of fruit produced, vitamin content, etc. The Japanese crab, *Malus floribunda*, shows great promise of use by wildlife. It bears heavily almost every year; its fruits are small; they persist until spring, and it is a common sight at the Arnold Arboretum to see pheasants feeding on the fruit both in and under these trees in

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A, Young mallards in the Seney Migratory Waterfowl Refuge, Mich. (Biological Survey photo.)

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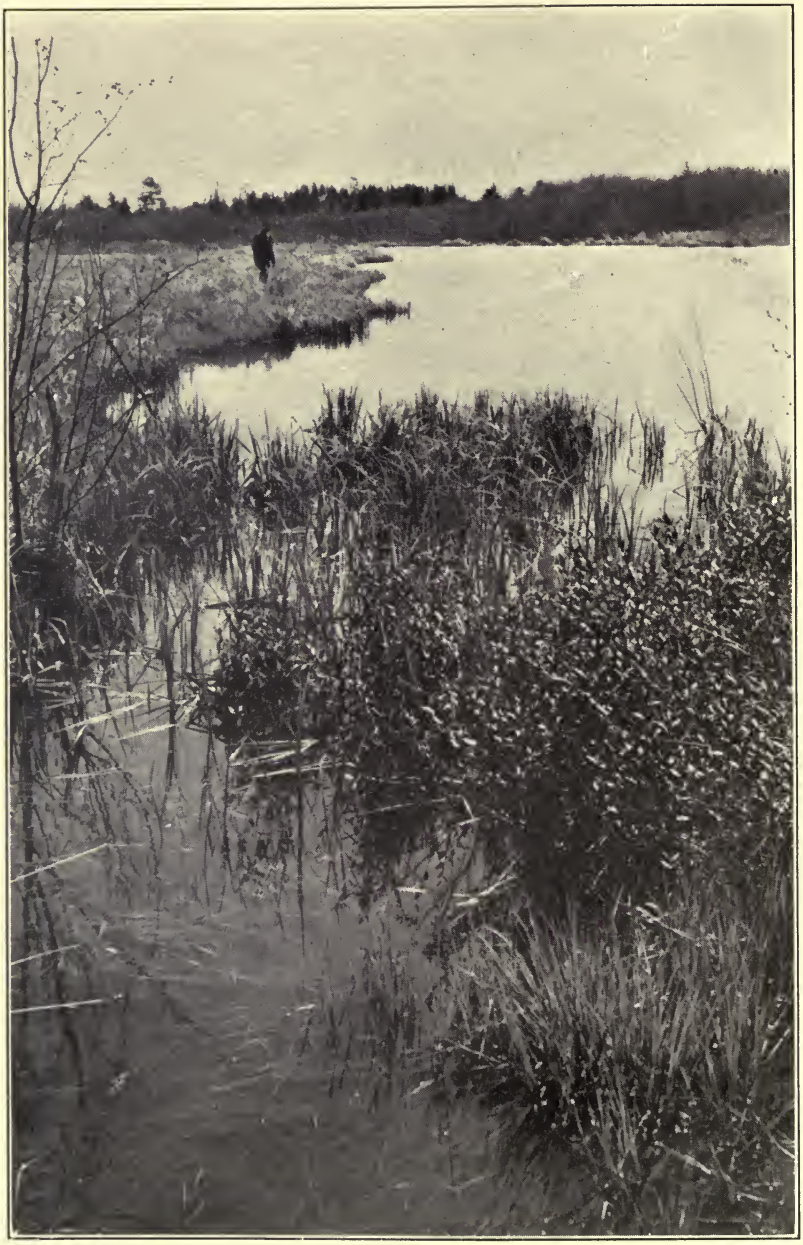
B, Beaver house in the Seney marshes. (Biological Survey photo.)



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Beaver pond in the Seney Migratory Waterfowl Refuge, Mich. (Biological Survey photo.)

winter. *Malus Soulardii*, a hybrid between a crab and the common apple, is remarkable for its vigor and heavy, regular fruit crops. Its fruits are two inches or more in diameter. The plants are best propagated by budding or grafting.

The poplars, black and yellow birch, sometimes regarded as "weeds" in forestry, provide buds and catkins which are very attractive to the ruffed and sharp-tailed grouse. Enough should be left in forest stands to provide for this use.

The black cherry is a timber tree which, when allowed to develop a large crown, produces heavy crops of fruit nearly every year. The fruit falls from August to October but remains usable on the ground for some time. The tree is fast growing, but is regularly attacked by the tent caterpillar, a serious enemy of commercial orchards. The plants are grown from seed afterripened 69–90 days at 40° F.

The black locust has many uses. It is a very good species for posts; it is being widely used in erosion control; it is a legume and hence a soil improver and produces good crops of small, bean-like seeds which fall from the pods during winter. The plants are easily grown from seed stratified over winter or scalded with boiling water before sowing.

The nightshade, a half-woody climber, does well in either swamp or upland soils. It ripens its red berries from August to October and they persist well into the winter. This is an outstanding pheasant food. It can be reproduced by either root or stem cuttings.

The highbush blueberry, *Vaccinium corymbosum*, is an acid soil plant of either the swamps or uplands. It produces good fruit crops nearly every year and needs no introduction as a human food. The fruits fall by the middle of October, but the dried berries are available from the ground for some time after. The plants sucker freely and transplant well.

The highbush cranberry is especially recommended for moist sites in acid soils. The bright red fruits ripen in August or September and persist until spring. The plant is a valuable ornamental, but is subject to aphid attacks. Propagation is by means of suckers, layers, or from seed which, however, requires a special afterripening treatment.

The various species of wild grape need no recommendation as food for the game and song birds. The fruits fall with heavy frosts, but pheasants have been found digging through 8 inches of snow to get the dried fruits in February. The vines are especially useful running over fences, walls, steep banks, etc. The plants can be easily reproduced by cuttings (4).

Among the conifers suited for cover plantings, white and red pine succeed on all but the sandiest soils where jack and Scotch pine can be used. Norway and white spruce do well only on the better soils, avoiding sands at one extreme and clays or wet locations at the other. Douglas fir grows well in the northeastern States, but is apt to be killed in some locations, at least, by a disease of the needles. Where conifers are planted for cover and timber production is not an object, wide spacings such as 20 feet between trees allow them to keep their lower branches alive to the ground and provide cover for a much longer period.

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In conclusion, we can say that from the standpoint of information on food production from woody plants, use of the fruits by wildlife, and nutritive value to wildlife, we are just making a beginning. It will be years before we will know the complete answers to many of the important questions involved and, in the meantime, we will have to be guided by experience and the little other information that is available.

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DISCUSSION

The Chairman. It is quite valuable to have analyses made of native foods, as such information is very scarce. With regard to statements that have been made about certain things that are commonly eaten by wildlife being starvation rations, I think that these remarks should not be accepted at face value. While animals in captivity may starve if given only a single food, that is not the way that wild creatures feed. Very few species of wildlife confine their diet to a single sort of food. We do know from experiments in dietetics that some things are exceedingly important even if taken only in small quantities. It may be that wildlife gets these things from some of the fruits that in experiments seem to be inadequate foods. I feel that it is much safer to make our conclusions from what animals eat in nature than to reply upon experiments.

Mr. Hosley asked about the use of privet. From what I have been able to gather, it is sometimes cleaned off bushes at the end of winter. I do not know just what the reason is; it may be the scarcity of other things, or a change in condition of the fruit.

Another point is about poisonous or other objectionable species. I come up against that problem in preparing papers for publication by the Department of Agriculture. It does not seem right to recom-

mend plants that are injurious to domestic stock. I find, however, that when we begin to eliminate we soon omit a lot that are used by wildlife. Bittersweet, a plant mentioned by Mr. Hosley, is an example. There are the junipers, currants, barberries, and buckthorns carrying rusts destructive to economic plants. Wild cherries are greatly objected to as harboring tent caterpillars. The persons interested in wildlife may think that after all these eliminations there will be nothing left. In the future, perhaps, we should put in everything valuable good for wildlife; but indicating the poisonous or otherwise objectionable kinds, then let the wildlife manager use his judgment. There are many places where he could plant things where domestic stock would not come; also he might be distant from orchards, so that the things that are hazardous to orchards, such as rust-producing plants, would not be dangerous.

Mr. George A. Cromie (Canada). What experience have you had with thinning woodlands to encourage shrub undercover?

Mr. Hosley. It is very important in coniferous stands. Plantations may be practically devoid of undergrowth until 30 years old.

Mr. Cromie. In Canada we have made some interesting experiments there where chestnut comes in as you have said.

The Chairman. We speak about nurseries and planting, which are all right. We should, however, use judgment by sparing valuable species during thinning operations. We would not have to plant so much in nurseries if we used thinning more sparingly.

Mrs. Frankel (Iowa). We have difficulty in finding out scientific means for cover restoration.

Mr. Hosley. You are thinking in terms of restoring natural conditions where they have been unbalanced?

Mrs. Frankel. Yes.

The Chairman. I think that one phase of it is being attacked, namely, the treatment of seed which will result in the highest degree of germination. The Lake States Forest Experiment Station is working on this.

Mrs. Frankel. I have been following several hundred individual plants for 3 years. We are going to carry these experiments on for another year, and then we will have some ideas about it.

A Voice. We, in Connecticut, now through the C. C. C., are conducting experiments in natural reproduction of native conditions in small areas. There is nothing printed available, however.

Mr. Gardiner Bump (New York). Most of you have C. C. C. camps in your States. We have secured very excellent cooperation from our camps. If you have camps in your State you no doubt can get much help from them.

Mr. O'Byrne (Virginia). In a good many places is it not a question of soil? The land has been subject to cultivation. Perhaps washing has taken away a good deal of it, and you have an entirely different soil from what it was. If this soil can be returned to its natural condition, natural growth will come back with it. It we are not too impatient, natural conditions will come back themselves.

The Chairman. The Soil Conservation Service can furnish information on species valuable in pioneering on poor soils.

Practical Waterfowl Management

(By J. C. Salyer, U. S. Bureau of Biological Survey)

The title covering my few remarks at this time was chosen for me by the committee organizing the program of the general Wildlife Conference. This explains, perhaps, the ambitiousness of such a selection. More properly, my talk could come under the heading of "Practical Waterfowl Refuge Management."

This is true because at this time we do not have a national migratory waterfowl management program that is finite. We are now in the formulative stage of such management, the final fulfillment of which will undoubtedly be seen in the next decade. Certainly with all the previous data and long history of waterfowl observation and research done by the Bureau of Biological Survey and other organizations, when taken together with the talented young men now going into the work of wildlife management, restoration, and preservation, we shall, beyond doubt, see a practical waterfowl management program crystallized within that period. The present waterfowl crisis through which we have been going, in one way has been a blessing. It has most pertinently revealed to us how haphazardly this great resource has been maintained and how easily, by a few rash acts or years, it may become totally lost to us.

The national migratory waterfowl restoration program and the past season's stringent regulations were conceived to bridge over this perilous gap in the life history of some of our most important species of waterfowl which were so dangerously near extinction. We have now been pursuing this Nation-wide program of preserving and restoring large areas of original waterfowl habitat for the period of 1 year and 7 months. During that time, we have been able to create 45 refuges, totaling 1,513,477.05 acres. Our restoration efforts have been felt in almost every State of the Union. All types of authorities and organizations have cooperated splendidly in the restoration movement. The completion of the present program plans will see a Federal refuge in every heavily overshot area, and every existing waterfowl marsh in the Nation of strategic importance to waterfowl will be under Federal control. The question, then, of maintaining a breeding remnant, or broodstock, of these valuable birds is speedily being solved as this refuge program advances.

I cannot here have the opportunity of discussing every type of refuge and its specific problems in our program. I think I can best give you a general idea of our everyday waterfowl-management philosophy and its application specifically in the important waterfowl areas of the country by selecting typical refuges in the various waterfowl regions having specific local problems and by demonstrating to you the mechanics of restoring waterfowl habitat and preserving the birds in numbers sufficient to permit wildfowling to continue as a practical sport in the Nation.

I should perhaps explain that in this program we establish three types of waterfowl refuges: (1) The great nesting marsh restoration of the North and Northwest. (2) The intermediate nesting and feeding migratory refuges along the four great flyways of the continent. (3) The large-scale wintering refuges in the southern

part of the country, extending from the mouth of the Delaware to the Sacramento Valley in California.

THE NORTHEAST ATLANTIC WATERFOWL REGION

Let us first turn our attention to the type of refuge to be found in New England and the Middle Atlantic States, taking for our refuge type the Bureau's present Blackwater (Md.) Refuge.

In this region, a few species of ducks breed sporadically over wide expanses of the country back from the shore, speedily congregating again in the autumn flight at certain strategic places along the coast where food and shelter are most propitious. As food is exhausted and the rigors of winter increase, these flocks are driven southward. In the Chesapeake and Delaware Bays, however, they winter, except when exceptionally severe winters, such as we are now experiencing, drive them still farther south by the freezing of the refuge waters. A great deal of local breeding takes place on these coastal refuges in this latitude but not enough to justify the establishment of the refuges for this purpose alone. Their greater service is seen in supplying havens of safety and sustenance along the migratory pathways to be used by the birds in the two great annual migrations, spring and fall.

Invariably, the water supply of these coastal and near-coastal areas in this Northeast region is brackish, varying from the actual salt content of sea water to a mildly brackish situation, the latter of which is the most productive. Our great problem here is to enhance the natural food supplies and to provide a sufficient diversity of food materials to make the refuge attractive during both migrations. Cover is generally a secondary necessity throughout this region. Often our possibilities are interfered with and, to some extent, limited by discoloration of the water, which is generally of fresh-water swamp origin. These coffee-colored waters greatly reduce the penetration of the effective rays of sunlight required by plant growths, thus limiting food production where conditions are otherwise excellent. This is one of our obstacles on the Blackwater Refuge.

We must further study the salinity tolerance of the various waterfowl food plants and make introductions of those species which have the best chance of survival. The food-habits section of the Biological Survey has many experiments under way leading toward a better understanding of such conditions, the most suitable species of plants to utilize in these areas, and special methods of propagation under these conditions. As fast as this research data is accumulated, our program will go forward. Incidentally, I should remark that it is the food-habits report that is one of the first pieces of basic information secured on any proposed refuge area; it tells us at a glance what valuable food-producing plant species are on the area to begin with and also the probable trend of the marsh ecology. One of the greatest problems and adjustments in practical waterfowl management is the controlling of the marsh ecology towards the best interests of waterfowl; and, concomitantly, the fur resources derivable from the marshes are similarly controlled.

At the present time, we are striving to introduce and spread the following species of attractive waterfowl plants: Water hemp (Acnida cannabina); leafy three-square or salt-marsh bulrush

(Scirpus robustus); widgeon grass (Ruppia maritima); sago pondweed (Potamogeton pectinatus); muskgrass (Chara sp.); and other brackish-water tolerant plants.

We are confident that this region would see a greater usage by migratory geese if we could provide the necessary gravel pits and dry spits or bars for their resting and loafing places. There is considerable goose food present, but the marsh at present is almost entirely too wet for protracted usage by geese.

During the summer, this area has a fine nesting population of black ducks and blue-wing teal. Some 3,000 acres of upland on the refuge will be devoted largely to upland game protection and the raising of considerable quantities of corn, wheat, soybeans, etc., as a supplementary food supply for wintering and spring-moving waterfowl.

The Blackwater Refuge is one of the finest muskrat-producing localities on the Atlantic seaboard. The furs produced here are of the highest grade, and a great percentage of them are of the valuable dark variety. Extensive muskrat managing experiments will be undertaken here in conjunction with the Section of Fur Resources of the Biological Survey. It is interesting to note that the welfare of waterfowl and muskrats is identical up to a certain point. This refuge will be the site of an interesting study for such dual management. The Government will speedily realize the original cost of this area from the revenues returned by the possible rat industry here.

A necessary development on all coastal refuges having brackish water is an increased area of continuous fresh-water ponds. Although the waterfowl can feed in very salty sounds and bays, they must have fresh water and often must resort to protracted trips inland to secure it. The presence of fresh-water ponds in an area greatly enhances its value. Because of the peculiar topography and geography of many of our coastal areas, we must resort to artesian exploration in order to increase the fresh-water supply.

THE MIDDLE ATLANTIC WATERFOWL REGION

Our management practices in this area are best exemplified by the great Lake Mattamuskeet and Pea Island Refuges in North Carolina. They lie in an area of coastal bays and sounds which, for untold ages, has been the winter concentration point for the continent's waterfowl. Geese and brant from Hudson Bay and the great interior nesting areas of Canada, as well as a healthy contribution from the great Mississippi flyway, habitually winter here.

Lake Mattamuskeet is a 52,000-acre lake which was formerly unsuccessfully drained, and was one of the initial restorations of the Bureau's waterfowl program. It is the greatest wintering ground for Canada geese and swans on the Atlantic coast. We normally have from 15,000 to 18,000 Canada geese and from 8,000 to 15,000 swans wintering here.

Because of a period of high water, reducing the growing areas for the favored food of the waterfowl in this region, the American three-square (*Scirpus americanus*), we have recently had to put every possible square foot of land into supplementary food crops, such as wild rice, corn, and cowpeas. The cowpeas were an experimental

adventure which panned out quite successfully. The geese have shown a real attraction to this food. The prophesy of the natives of this region that the peas would swell up and choke the geese to death has not as yet come true in a single instance, nor was it anticipated thus.

One of our first problems here is to so control the lake level as to have broad expanses of marsh covered by but a few inches of water, which is the ideal situation for large-scale production of the region's best food plant—the three-square bulrush. The lake itself is traversed at regular intervals at right angles to its long axis by the spoil banks of the original canals dug to drain it. These spoil banks must be perpetuated in order to reduce wave action sufficient to produce great quantities of submerged pondweeds so necessary as a further supplementary natural food supply of interest to the duck group of the migratory waterfowl clan. At present, ducks are not so numerous, but a great increase can be expected with the production of foods suitable to them.

We have taken advantage of a natural phenomenon here to permit at the same time a low lake level and the maintenance of broad areas with the few inches of water over them necessary to produce the three-square. Mattamuskeet, for a lake of its size, has remarkable seiches. By the placing of very small dykes between the spoil banks, large marsh areas, by action of the seiches, are periodically filled and replenished with fresh water necessary to bulrush production, while at the same time the main body of water, with its destructive wave action, is forced out from these producing areas. This great lake lies but 6 inches above sea level. Tide gates are necessary to prevent the inrush of salt water at certain high-tide periods, which would retard plant growth in the water if permitted to enter too freely, for a number of years.

You can see, then, that we must control the water levels of this area to a delicate margin. The lake itself has a tendency to grow as it is in a natural sump area. As it grows, it encroaches upon private farm lands which must be protected. We must seize upon every low-tide period to discharge as much water as possible. Additional outlets are being created as rapidly as possible to facilitate this discharge.

Since the Bureau has taken possession of the lake, we have instituted large-scale control operations on cattails. The low-water levels required for the best three-square production also are ideal for cattail production. Cattails are possibly the worst weed in the waterfowl marsh, being desirable neither as food nor cover. Thus far, we have found the most effective retardation of this pest to be to cut the cattails at least twice in each growing season. This means when they are a couple of feet in height in the spring, and again in the early fall. This double cutting in one growing season appears to starve the roots. Such type of control has only been possible in the thousands of acres we have to contend with here by virtue of the availability of E. C. W. labor.

The recently acquired Pea Island Refuge off the North Carolina coast, on the great sand reef extending in a crescent off these shores, has several unique problems of waterfowl management. This is as far south as the greater snow goose of the Atlantic coast winters. A large flock has for years been faithfully adhering to the Pea

Island area for a wintering ground. This year, we have between 9,000 and 10,000 of them wintering there, with one-third again as many Canadas, many brant, and a great variety of ducks.

The sound on the leeward side of the area formerly abounded in eelgrass (*Zostera marina*), wild celery (*Vallisneria spiralis*), redhead grass (*Potamogeton perfoliatus*), and muskgrass (*Chara sp.*). We are happy to note that this year after a number of years of scarcity, these plants are returning in fine shape.

Fresh-water ponds have, in the past, been maintained here by private hunting clubs and have had a marvelous patronage by waterfowl. We intend to restore and enlarge these ponds, which recently have been seriously damaged by storms, on an engineering basis more conducive to their permanence. At the same time, an extensive planting of the protective dunes on the east side by sand-holding plants and brush-and-sand fences will be undertaken. The fresh-water ponds will be adequately stocked by natural aquatics acceptable to the anserine palate. Artificial gravel bars will be provided at strategic points.

The two principal goose foods on this area are a low-growing three-square (*Scirpus olneyi*) on the dunes and sand flats and a lush growth of salt-marsh grass (*Spartina alterniflora*). In the management of this latter plant, the waterfowl manager shows his fine discrimination. This plant, when it grows along the usual salt-water creek, channel, or floodway, makes a rank, coarse growth often higher than a man's head and entirely unacceptable to waterfowl as food. However, this same plant, if made to grow in a wet meadow where slightly brackish water of 2 to 3 inches is always present, becomes quite tender; and the root stalks are apparently then relished by the wintering waterfowl.

This winter on Pea Island there were to be seen acres of wet marsh absolutely denuded of this grass by the hungry hordes of geese. Low masses of the unused top portions of the plant were lying about like a man-made hay field.

The Pea Island area has been the scene of extensive waterfowl persecution and slaughter since in the past it has been impossible to properly police and protect the area without Federal ownership. Now that it has become a Federal refuge, such depredations on the wintering flocks will immediately cease.

THE GREAT GULF COAST WINTERING REGION

In this area lie the remnants of a former great coastal marsh which formed an inviolate winter home for our waterfowl and was such a great factor in sending back to the beckoning Northland the proper number of breeding birds to keep up the resource.

In comparatively recent years, a great despoliation has visited this great area which extends from the mouth of the St. Marks River in Florida, through the Mobile Bay region of Alabama, the Delta and Cameron regions of Louisiana, and on down the west coast of Texas, with Galveston Bay, Laguna Larga, Laguna Madre, and the Brownsville Lagoon being tremendous concentration points for wintering birds. The exploitation of this last mineral field in our

country has been consequent with serious damage to the pristine marshes here, both because of the attendant pollution and the unwanted human interference and activity on these formerly isolated winter sanctuaries. Moreover, an unwise management of the fur resources here has served to affect the marsh ecology adversely for waterfowl. No less than three great plant pests, or waterfowl marsh weeds, have appeared and are making serious inroads in the formerly fine waterfowl areas found here.

We in the Bureau who are charged with waterfowl preservation have considered it our fundamental duty to attempt to preserve the unspoiled remnants of these fine areas and dedicate them to the perpetual enjoyment and usage of the glorious waterfowl species which have made of them from time immemorial their hereditary wintering grounds.

For our example in this region of waterfowl refuge management and some of the problems obtaining here, let us choose the Delta Migratory Waterfowl Refuge lying at the east side of the Mississippi River mouth or delta. This refuge comprises 37,000 acres of land made since Cubit first punctured the river bank here and started a small trickle which the mighty river soon improved into the now enormous Cubit's Gap, or main eastern channel of the delta, which has since that time deposited some 75,000 acres of "made" land. It is on this comparatively narrow borderland of accretion soil lying immediately adjacent to the gulf waters that the greatest production of waterfowl food—again the three-square bulrush—takes place.

Due to the destruction of the marshes in other parts of the Gulf coastal areas, an increase in the waterfowl usage of the delta area is discernible yearly. Our counts this year show a decided increase in the waterfowl population under the Bureau's management.

The average life of the accretion goose land is about 7 years, by which time the river has deposited sufficient soil to render the land first deposited sufficiently high and has blocked off certain side channels to make fresh-water ponds which then have a greater utility for ducks. This area, then, is ideally serviceable to both geese and ducks. A number of fine food species occur in the fresh-water ponds, among which should be mentioned the delta potato, which is perhaps the only one of its large family which is of primary importance to waterfowl.

Here, again, our waterfowl management is complicated by a plant pest—this time it is the alligator grass (*Alternanthera phyloxeroides*). This plant first appeared after a number of bad Gulf storms in the interval around 1918–20. Since that time it has spread over the pond areas of this fine region, as far west as Lake Calcasieu in southwestern Louisiana, and as far east as Florida. It was unwisely planted in parts of South Carolina and Virginia under the impression that it was an excellent duck food. Here, again, the investigations of the Food Habits Section of the Bureau quickly demonstrated its utter worthlessness in this respect and, for the time being, it has stopped such fateful introductions. This plant, when appearing on a given pond, speedily spreads out like a green mat over the entire water surface, completely choking out of existence all of the plant life. It appears to grow luxuriantly until the fertility

of the particular body of water is exhausted, when the whole mass dies, decomposes, and creates a vile, nauseous morass scarcely attractive to any type of higher vertebrate life.

We are now seeking both physical and chemical means of controlling this undesirable duck-marsh habitant. Thus far we have discovered that one of the best methods of discouraging it is to run the floodwaters of the river at its highest stages through the labyrinthine chains of sloughs, lakes, potholes, and pools which the terrain here presents, thus flushing them out into the river or Gulf again. This is done by digging canals and ditches to carry the river waters into the now closed-up former channel heads on the west end of the project where they formerly connected, through the east bank of the river, with the Mississippi. The high water normally flushes out the area, but also brings in a necessary deposit of fine, rich silt, which each year gives up a splendid and quick food-plant growth. Flushing by the river has a tendency to check periodically the complete usurpation of the water areas by the alligator grass. There is no land available for artificially adding to the food produced on the area, and we must make every endeavor to develop the natural food to its highest point.

The area also has an enormous rat population, requiring scientific management.

Another type of refuge obtains along the southwest shore of Louisiana and the coastal area of Texas. For example, we will take the 137,000-acre Sabine Lake Refuge. This is the largest unspoiled primitive fresh-water marsh area in the Gulf region. It has perhaps the largest population of wintering geese in the United States. It has a great complexity of other bird and animal life, too.

The food resources necessary here must be produced in tremendous quantities and must be again natural foods. The ideal type of management for this area, in view of its immense goose population, is the wet-meadow or marsh type of management; that is, the management consists in maintaining thousands of acres of marshland with a very few inches of water over it constantly, producing a great variety of chufas, spike rushes, bulrushes, Spartinas, and so forth, which, when growing in such lush areas, are wholesalely palatable to the waterfowl. Deepening the water here to a foot or even several feet would reduce the carrying capacity of the marsh for these birds.

Certain ill-advised canals formerly dug in this area will be closed up, and the water areas will be stabilized to spill all excess waters over the few inches necessary for this lush growth. Even with this type of management, the region will have hundreds of small ponds and pools of a sufficiently greater depth to be extremely attractive to wintering ducks which also winter on the area in large numbers.

This refuge also has an annual rat production of gigantic proportions. The maintenance of this rat population, concomitantly with the waterfowl wintering possibilities, requires a nice ecological adjustment and a careful regulation of the rat take again.

In summarizing conditions on the wintering marshes, it is interesting to note that forage conditions suitable for geese especially can be secured through three different avenues. For example, the haying of the salt marshes in the Delaware and New Jersey marshes makes the various species of Spartina in their yearly spring growth

throw up tender shoots acceptable to geese and brant. At this time we find brant on inland salt-marsh hayfields where they had never been found before. In the Pea Island and western Louisiana areas we make the same species tender and palatable to geese by keeping them covered with fresh water to the depth of a few inches. On the St. Marks Refuge in western coastal Florida and the extensive coastal marshes and grasslands of eastern Texas we find the same species and some others made usable by waterfowl by the fact that they have been grazed closely by cattle. The new shoots again are tender and attractive to the birds.

Throughout this area it is desirable to supply grit for the birds artificially.

THE INTERIOR MIGRATORY WATERFOWL REGION

This area encompasses the middle reaches of the United States, such as the middle portion of the Mississippi Valley, the Illinois Valley, the Ohio Valley, the valleys of the Platte, the Kansas, the Arkansas, the Pecos, the Rio Grande, the Colorado, the Bear, and the Sacramento Rivers, together with the interior basin.

Although considerable nesting takes place in this region, it is better known because of the moving thousands of birds which migrate through it. Here we have located, at strategic concentration points and with consistent regularity, feeding and resting refuges of efficient sanctuary service to the migratory birds, ranging in size from 5,000 to 10,000 acres. These individual refuge areas frequently have concentration of as high as 50,000 to 75,000 birds. Great efforts are made to produce large quantities of natural waterfowl food plants.

Let us take for our refuge type in this case the Squaw Creek Migratory Waterfowl Refuge in northwestern Missouri, adjacent to the Missouri River bottoms. This refuge represents a 7,000-acre segment of a somewhat larger drainage district unwisely instituted in the past. Its water areas have been restored by careful engineering features comprising dykes and water-control spillways. A certain amount of upland was acquired in order to control the water areas and to sufficiently protect the birds from molestation, as well as giving them the proper isolation. By regulating the water levels of this refuge during the growing months, enormous quantities of duck millet, Chufas, and smartweeds can be produced. In the fall and spring flights they are made available to the birds by closing the gates and causing the units to fill up with water, thus overflowing these natural acres of food.

The upland, besides being managed in the interests of upland game, produces an extensive yield of corn and other cereals which can be used to supplement the natural food found in the water areas. The water units here have been improved for fish production by the installation of shelter and food-producing devices to foster the growth of the fish population. They bid fair to supply some marvelous bass and other sports fishing. This is true of practically all of our interior and northern refuge restorations. They supply fishing many times in areas where such sport was not formerly available, and represent areas where the fish population can be success-

fully carried through during the winter freeze-up months without asphyxiation.

In order to reduce wave action over these water units, which are sometimes as large as 2,000 or 3,000 acres, we have thrown up with draglines and elevating graders a carefully planned series of artificial islands which not only afford fine nesting sites and loafing places so much desired by waterfowl but also retard wave action and thus make possible the production of aquatic duck-food plants.

These are but a few of the multifold activities undertaken to restore waterfowl habitat along the flyways.

THE NORTHWEST NESTING REGION

This area is properly composed of northwest Iowa, the sandhill area of Nebraska, all of the Dakotas, the western half of Minnesota, the Great Plains region of Montana and Wyoming, and the interior river valleys of Oregon, Idaho, and Washington. A typical refuge example for this region would be the Lower Souris Refuge in the Souris River Valley of North Dakota.

This area comprises 50,000 acres, 90 percent of which is duck marsh created by throwing storage dykes across the river valley at regular intervals along a 40-mile stretch. The river valley is particularly adaptable to this type of treatment, having a very low grade, and was formerly a marvelous waterfowl nesting area. It, too, had suffered the ravages of the drainage craze which swept the country in the early 1900's. This disease seems to be endemic, and periodically bursts forth in our social organizations with renewed virulence and still greater destruction to wildlife by virtue of the reductions of wildlife habitat by this deadly method.

The river valley varies in width from three-fourths of a mile to 3 miles through this stretch. Small enduring patches of some of America's finest duck-food plants are found straggling along the river valley. The water supply for these great marshes is sent down the river from the great upper Souris impoundment dam almost 100 miles upstream, which has a capacity of 112,000 acre-feet. Ten thousand acres of marsh are maintained immediately below this large impoundment dam, and the remainder of the water is sent down the river, as needed, to counteract the evaporation on the great lower Souris nesting marsh during the nesting season. All of this water comes from the spring snow-water run-off which, if not impounded and used judiciously, would speedily run out of the country with no material benefit to wildlife.

With the creation of this dam, flood protection was given to the important city of Minot, which has long been ravaged by the spring flood of the Mouse River. Also a sanitary nuisance in dry years was solved for some half dozen towns in the river valley. The water from this storage dam, as it is transported down the river, flood irrigates many acres of excellent hay lands for the benefit of the local farmers. The great reservoir will be a veritable mecca for the fisherman and a recreational center of great importance in this area for miles around.

On this refuge we see waterfowl management at its best. Studies are under way to show exactly what is the predatory pressure and to provide a rational basis for control if proven necessary. Artificial

islands and nesting places have been created until the marsh units, which vary from 4,000 to 10,000 acres in size, have a 1,000-island appearance. The area presents an infinite medley of islands with the highest type of waterfowl marsh surrounding them. It should prove irresistible to the waterfowl legions. These larger islands are supplemented by thousands of artificial rat houses. These are made by inserting heavy timber members in the soil to form a rectangle some 6 feet square. The area enclosed by the large posts and poles, which were secured from such timber as was unavoidably inundated by the project, is filled with misshapen and otherwise unusable stumps, limbs, brush, and debris of like nature, the whole being staunchly wired together by galvanized wire. In some instances the interstices have been filled with earth to make a more permanent mound. In the spring the waterfowl refuge manager comes along and covers these artificial nesting locations with a thick thatch of marsh hay.

Not only do these make attractive nesting sites but also they are attractive preening spots for mating waterfowl pairs. Necessity for this type of meeting place by the mating birds is not universally recognized as yet among many waterfowl specialists. The mating pairs meet daily at these places. A fairly accurate nesting inventory can be taken of the nesting pairs in a marsh by locating the preening spots. This is especially true of certain types of more or less dense marsh, where nests would be difficult to locate.

Goose flats have been artificially created at intervals throughout this area and covered with gravel. A large nursery is under way on each project to supply stock for use in erosion and blow-out control and in heightening the value of the area from an all-around wildlife standpoint.

The lower Souris and other nesting refuges throughout this region all have large populations of fine types of upland birds, such as two species of the sharp-tailed grouse, prairie chicken, ruffed grouse, sage hens, Hungarian partridges, and pheasants, the particular species present depending upon the location of the refuge. Management for upland game is almost as important on these areas as is waterfowl management; and in many instances we also have to foster and care for a number of big-game species. On one of the Northwest refuges, the trumpeter swan, a species facing extinction, is making a gallant last stand. The most valiant and persistent efforts will be made to protect and foster the increase of this magnificent species.

With a million and a half acres of land to revegetate and rehabilitate to the needs of wildlife, we have literally gathered tons of the highest type of food and cover plant seeds, root stalks, and cuttings. The extensive engineering works of this region, involving hundreds of miles of dikes, canal banks, islands, dams, embankments, etc., have been sown to grass and other plants which not only will bind and keep the soil in place, but also will afford excellent artificial nesting cover until the natural species can propagate themselves and take over this duty.

We intend to control the marsh ecology from the start. We could, perhaps, wait 5 or 10 years, which is the normal expectancy for the better types of waterfowl food and cover plants to establish themselves, and find our refuge program meeting with fair success. However, faced as we are with the present waterfowl crisis, we can-

not adopt such a laissez-faire policy. We must immediately plant and foster the more desirable species and control the undesirable. Already control measures are under way with respect to certain species which tend to run riot in newly created areas, such as cattails and Phragmites. Fundamentally our first efforts are directed toward securing a universal growth of a high type of submerged aquatic duck food, such as redhead grass and sago pondweed, and also one generally recognized high type of emergent food or cover plant, such as the round-stem bulrush group. If we can accomplish this, other more desirable species will filter in to the growing areas naturally and further round out the food resources of the projects.

Even with the tons of seeds already gathered, we could not universally plant all of our restored habitat, so we must resort to strip planting. For example, on a certain marsh unit we will plant round-stem bulrush around the entire unit in 4 to 6 inches of water and in a strip having a width of perhaps 100 to 150 feet, expecting the plants to extend in succeeding years by natural increment in both directions from this original strip planting. In this work we find that despite the great amount of work which has been done upon aquatic duck-food propagation, there is still much to be found out in the practical propagation of these plants on refuges. It is held that under natural conditions the seeds and nutlets of some of our most valuable waterfowl food and cover plants may not germinate for from 4 to 5 years; and yet, again, under certain conditions of storage which we have adopted, we find them germinating the first winter. I believe we have finally hit upon a problem which will enable us to control the germination exactly to fit our needs. This will be accomplished by alternate freezing and thawing of the rad-coated seeds.

On most of these Northwest projects extensive aquatic seed cellars have been made, utilizing spring or artesian water, for storing those types of seeds and nutlets requiring storage in cold water, such as pond weeds, wild rice, and so forth. For seeds which may be stored dry, extensive underground dry cellars have been established. Thousands of seedlings and cuttings have been heeled in for subsequent planting in the forthcoming spring. Hundreds of lake-bed improvement devices for better fish production have been installed. The availability of Emergency Conservation Works labor has made such wholesale restoration of the habitat possible.

In order to encourage the water supply and expedite the run-off into the desired marsh areas, snow fences have been erected to catch even greater snowfall on the waterfowl areas. In certain instances a method of terracing has been resorted to to prevent the water from sinking into the unnecessary uplands and to hastily conduct it into the pothole chains where it has its best usage. The incidental moistening of the upland acres from the initial phases of the rain and snowfall is sufficient to produce the necessary vegetation and nesting cover and at the same time prevent the soil from blowing away. In two instances we are experimentally taking over a large section of morainal pothole and lake country with the avowed object of waterfowl management of the area. This is largely comprised by the activities of conserving the water supply, controlling predators, regulating grazing, food, and cover planting, and sundry other activities. If this proves satisfactory, more areas of this type of even greater size will be placed under administration.

Throughout this area we find types of waterfowl food and cover plants locally abundant, but practically absent from nearby areas within such reasonable proximity that you would expect them to flourish if introduced to the areas lacking them. We are carefully investigating and attempting such introductions. A plant which is particularly valuable throughout the great basin area is the prairie bullrush (*Scirpus paludosus*). This plant produces valuable food and cover alike, and is a fine plant for alkaline areas with fluctuating water levels. It should be made to flourish on many a western alkali marsh and lake.

Waterfowl management in this region includes a host of kindred activities, such as the erection of patrol towers and roads; fire breaks and fire suppression; supplementary grazing of waterfowl lands because of the local economic situation; removal of excess refuge products, such as timber and hay, furs, and so forth; and the planning of recreational centers on the deep-water end of storage projects where they cannot molest the waterfowl but, at the same time, will admit of considerable social usage, such as bathing, picnicking, boating, fishing, and so forth. These latter facilities are much in demand throughout the Great Plains nesting area.

Engineering activities are undertaken with the specific purpose of reducing the featheredge water lines conducive to botulism. "Duck hospitals" are erected on refuges and areas having botulism outbreaks, where birds are gathered and nursed back to normal conditions. Around all the larger refuges, smaller supplementary refuges enhancing the value of the large refuges are cooperatively established on an easement basis. In the State of North Dakota 75,000 acres have been added to the refuge system by this method. This is a very fine type of water conservation, as the deep-water end of the impounded area is available to the public for recreation, water supply, and the watering of livestock. The shallow, marshy ends are kept as inviolate refuge areas.

Tantamount to the success of these nesting projects is the fencing to control livestock, as they are in the heart of a great livestock region. Our fencing bill literally runs up into the hundreds of thousands of dollars.

THE WESTERN TYPE OF NESTING REFUGE RESTORATION

This type of refuge has a number of specific problems wholly characteristic of the areas in which they are found. In every instance the successful maintenance of the refuge depends upon a close harmonizing of either grazing interests or irrigation interests and wildlife. Completed practical studies which are applicable on the subject of maintaining extensive range lands primarily for preserving waterfowl and other forms of wildlife and yet secondarily admitting of a controlled grazing usage have not yet been made. This is one of our most immediate problems, and we have a number of men at work on this question who are range examiners by technical training but also are primarily conservationists at heart. We foresee a successful solution of this problem in the immediate future.

In a number of other instances the waterfowl refuge has to be sandwiched in between irrigation practices in a given region. In some cases we have to use irrigation sumps as sanctuary substitutes

for the former fine waterfowl lakes now under cultivation through the two operations of first draining the lands and then making available their fertility by irrigation. Formerly these areas, such as Tule Lake, Calif., were the strategic concentration points on the Pacific flyway, besides being the former homes of inestimable numbers of all types of migratory waterfowl and other migratory birds.

Although the habitat has been terrifically changed by the drainage and irrigation practices, the birds, in the few years since this has happened, still adhere to their old hereditary pathways; and these areas necessarily will always be their regularly frequented concentration points. The maintenance of the flyway depends, then, entirely upon preserving at least a minimum resting and feeding ground for their requirements at these old concentration points. Without these interior resting and feeding grounds, the great goose flights characteristic of the Pacific coast would not be able to maintain themselves.

In these rather circumscribed refuge areas, then, we must maintain a minimal water area of at least 10,000 acres saturated, as far as possible, with the highest type of submerged and emergent duck foods. To have an all-around usage of the area, or as much usage as possible, artificial nesting islands must be thrown up in relatively deep water. We are now experimenting with a number of floating nesting islands of rather large size, which at this time give some hints of practicality.

Although a sufficient amount of grain is raised, along with other crops not primarily suitable for waterfowl food in these areas, the birds, especially geese and certain browsing ducks, such as the widgeon, are hard put for the proper amount of green food normally needed in their diets. This causes them to make serious inroads on truck crops of a succulent nature. It behooves the waterfowl manager in these areas, then, to attempt to maintain certain areas devoted to the production of green browse food. We have found alfalfa to be the best crop for this purpose. It is readily used by the abovementioned types of birds and is available throughout the year. Where land is available, we also attempt to cultivate every square foot of land not fitting into the upland game and nesting requirements of the area to quick-maturing small-grain crops which are gleaned largely by the migrating birds.

This is our most indispensable management feature also in the Southwest wintering region, which I do not have space to discuss at great length here. This district comprises the Panhandle area of Oklahoma and Texas, with adjacent regions in Colorado, Kansas, and New Mexico. With the great spread of small grain and dry farming in the area, thousands of mallards, pintails, gadwalls, and Canada geese have lately adopted this area as their most important wintering ground west of the Mississippi Valley; and in years when the crops, for climatic reasons, cannot be harvested early, they descend in a devastating horde and ruin the farmers by actually gleaning fields in a night. To keep the birds in good standing in this area, as well as giving the farmers economic justice, it is necessary that on all our refuge areas in this region (and we should have a number of refuge areas here to scatter the concentration) we take a considerable amount of upland for the primary purpose of cultivat-

895B

A, Wooded knoll that will become an island in the Seney Migratory Waterfowl Refuge, Mich. (Biological Survey photo.)

904

B, Havoc of drainage at Seney marshes. (Biological Survey photo.)

1143

A, Curlews in flight over sagebrush country near Medicine Lake Migratory Waterfowl Refuge, Mont. (Biological Survey photo.)

2049

B, Ducks at Blackwater Migratory Bird Refuge, Md. (Biological Survey photo.)

ing these areas, over and above the needs of the refuge, to these same small grains. The theory is that the birds, being unmolested on the refuge areas, will first exhaust this food supply, by which time the farmers will have harvested the greater portion of their crops. The birds can then subsist through the rest of the winter on the gleanings left after the harvest. In private practice this has worked out successfully, and there is no reason why it should not work out under Federal management. After all, the responsibility is a Federal one.

To summarize, our refuge system is founded on the following basic facts:

1. It is the duty of the Federal Government, and the responsibility of the Bureau of Biological Survey of the Department of Agriculture, to save a breeding remnant of these valuable migratory waterfowl species through adequate and well-planned refuge service and restrictive regulations on the annual kill.

2. The few great tracts of unspoiled primitive waterfowl marsh left in the United States should speedily be converted into permanent waterfowl sanctuaries, especially in the wintering areas.

3. Large-scale nesting restorations, through the establishment of nesting refuges, should be made in the great Northwest migratory waterfowl breeding grounds within our borders.

4. Intermediate feeding and resting refuges should be established strategically and at regular intervals along the main flyways and subsidiary flight lanes, which have been, for all practical purposes, satisfactorily worked out by scientific bird banding. There is no guesswork left on this score.

5. These refuges of all types, when once located, should be developed to the utmost degree with regard to food supply, carrying capacity, nesting cover, and all other inducements to the prospective waterfowl users. In other words, waterfowl marsh habitat in the United States is so reduced from the original acreage available to the birds that the carrying capacity of every acre left must be increased and enhanced as much as possible by modern scientific waterfowl management.

6. To complement the Federal refuge system and to extend the sanctuary service to waterfowl to the degree necessary for continued preservation of the birds, a host of smaller, subsidiary Federal-State cooperative refuges should be spotted between the gaps left in the Federal system where, for various reasons, the necessary number of Federal refuges could not be established. There is a limit in the institution of Federal refuges beyond which we cannot justify Federal administration because of such limiting factors as size, waterfowl density, and primarily, usage of the land for more socially or economically justified purposes. The State, by virtue of having to have also an upland game management service and a permanent warden service, can often administer smaller units which do not justify Federal undertaking. A number of these cooperative refuges are already established, and their success calls for an extension of this type of service. It serves to more closely bring together Federal and State wildlife interests.

7. The management of either a Federal or a State refuge system, especially migratory waterfowl, calls for a talented field personnel with a good, technically correct background and a diversified personal

experience and adaptability because of the varied arts and sciences called upon to successfully create and maintain a waterfowl sanctuary. A successful waterfowl management agent must have not only a sound biological background but also a dash of the engineer and the practical game warden; he must have had experience in farming or ranching and forestry; he must have an administrative and sociological, or social usage, background. In instituting this program we have found a real dearth of men even technically trained in the rudiments of waterfowl life history. The new host of game management and wildlife management schools now springing into existence would do well to give special heed to this problem. The one specific type of training most often lacking and of fundamental importance is a good background in aquatic botany and ecology, which is the starting point of our restoration of waterfowl marsh habitat.

8. Finally, to intelligently manage our great waterfowl resources, we must have a more exact accounting system of our production of North American waterfowl and its annual distribution and utilization to enable us to perpetuate the resource. With almost 200 refuges now established in the United States along every flyway and at every concentration point for waterfowl, the Bureau of Biological Survey will soon be in a position to have the most comprehensive waterfowl-counting or inventory system obtainable, and we will soon eliminate the guesswork of waterfowl numbers and utilization, at least within the borders of the United States.

DISCUSSION

Mr. Gardiner Bump (New York): I would like to ask Mr. Salyer what depth of water is necessary for the black duck.

Mr. Salyer. Black ducks use water to a depth of 2 or 3 feet. However, in the past summer they used mosquito marshes where there was practically no water. In Michigan they have been observed nesting at some distance from water. The most typical habitat is a meadow where in the spring perhaps there may be 2 or 3 feet of water, but maybe later on 6 inches or a foot, and maybe none.

The Chairman: Probably the first thing is to decide what plants to encourage, and regulate the depth of water accordingly.

Maj. H. O. Swindler (Washington, D. C.): What publication can I get on this?

The Chairman. The Bobwhite Quail, a book by Stoddard, contains information largely applicable to conditions in Virginia. This book is published by Scribner's.

Mr. W. E. Burlington (Montclair, N. J.): I would like to ask if you worked with pheasants.

Mr. Bump. You will find by looking at the chart here that we have liberated 100 pheasants. There is no question, also, but what pheasants have come into areas from the outside.

Mr. Maynard S. Johnson (Springfield, Mass.): I neglected to note down the area of this tract.

Mr. Bump. 3,700 acres.

Mr. Johnson. Can you give me approximate man-days?

Mr. Bump. I was expecting that question. The approximate number of man-days might be computed. Approximately three-fourths

of the labor from a C. C. C. camp for pretty close to 2 years was used.

The CHAIRMAN. The speaker said that there were approximately 50 miles of feed strips, and gave the total cost. The cost per mile would be about $25.

Mr. BUMP. I would say that that would be a reasonably good estimate.

I would like to state here that we were trying to find out what could be done with an otherwise nonproductive area. The answer is: We can bring into production an unproductive area over a period of time, but we have no close figures on account of employing C. C. C. labor.

FROM SCRUB OAK AND PITCH PINE TO QUAIL

(By GARDINER BUMP, New York State Conservation Department)

Scattered across the landscape, a scant 60 miles east of the city of New York and occupying a substantial share of the eastern end of Long Island, there lies a wilderness known as the scrub-oak belt. Farmers have long since abandoned energetic efforts to extract from the sterile, acid soil a living. Daily commuters have been hardened to the spectacle of frequent spring and fall fires which periodically aid the scrub oak in its attempt to usurp the land still occupied by pitch pine and by its better cousins. Were it not for a scattering of deer, grouse, quail, and fur bearers, notably red fox, it might rate as a first-class undesirable area.

During the World War the Federal Government purchased some 8,000 acres of this land and, after clearing portions of it, established thereon a training area for manpower, Camp Upton, by name. The end of the war saw the close of the camp and the gradual reversion of the site to brush. So little seemed to be known of the proper measures necessary to induce such an area once more to bear an economic crop that, with the advent of the C. C. C. camps a solid block of 3,700 acres was, with the permission of the War Department, set aside as an experimental area. To the foresters the area represented an opportunity to determine the chances, methods to be employed, and cost of wresting an area from scrub oak and returning it to the production of more economic forest crops. To those of us who were game managers, knowing little about the management of such a waste, it presented an opportunity to determine something of present carrying capacity for the game species inhabiting the area and of developing ways and means of increasing them.

Previously closed to public hunting by the War Department, the possibility of opening it to help relieve the hunting pressure caused by the issuance of over 45,000 licenses within a 60-mile radius of the area and resulting in the posting of most of the otherwise good hunting opportunities thereabouts, was also not to be overlooked. A quick reconnaissance of the area in the fall of 1934 led us to believe that about 250 quail, 20 grouse, and an undetermined number of deer were present. No pheasants were to be found. A glance at the cover map may serve by way of explanation. You will be quick to see thereon that better than two-thirds of the entire area is covered with scrub oak brush or with a pitch pine-hardwood type combination. The

majority of the open land contains a scattering of brush over large areas of sandy sparsely stocked grasslands. Legumes are not particularly common except in one corner where an old farm was at one time under cultivation.

Realizing that one at least of the limiting factors was feed, and suspecting the one-sided distribution of openings to be also definitely inhibitory throughout the brush and wooded part, strips 50 feet wide and averaging about 600 feet apart, were marked for clearance. With the aid of C. C. C. camp labor, these were cleared (cut and stumped), plowed, and planted to a green soiling crop to counteract the natural soil sterility inherent in the region. Later these were planted to a variety of grains furnishing game bird food, such as the millets, buckwheat, rye, oats, wheat, and so forth. Food strips to the extent of 49.3 miles in all were thus established. To protect the area from the danger of extensive fires 19.8 miles of a combination feed strip and fire line were also prepared.

Two special projects were undertaken. On the "remount" area, whereon the mules and horses were kept during the war, and on the farm area, experimental plots have been established. Here over the past year some 41 separate commercial grains, together with about 20 plants collected in far corners of the earth, were planted under varying conditions and at various periods within the growing season. The results were carefully tabulated.

Since the area was designed to furnish a crop of timber as well as a crop of wildlife, some areas were reforested to Norway spruce or to the various pines. Some forest-stand improvement work was carried on in an experimental way within both pitch-pine-hardwood and the scrub-oak types, looking toward the release of the better species. Wherever this resulted in cover denudation adjacent to our food strips, "cover islands" approximately 50 feet wide and 100 feet long were left at 300-foot intervals.

Water holes in addition to the four or five natural ones already existing on the area, to the extent of six or seven more, were constructed not only to furnish water as needed to wildlife, but also to furnish an added means of fighting forest fires. Over the period of development predators, particularly foxes, were abundant. A small amount of time was spent in their control resulting in a reduction of their numbers of not to exceed 20 percent. It was found necessary to destroy a few individual predatory hawks of the following species: Sharp-skinned, Cooper's, red-tailed, and marsh. No hunting was permitted on the area during this period.

The development was practically complete insofar as the establishment of food and cover was concerned in the fall of 1935. In December and January (1935 and 1936) a careful census was taken of the wildlife resident at that time over the entire area. Because of finances, it was necessary to supplement the services of a trained wildlife technician with those of a number of C. C. C. camp boys in carrying out this survey, thereby reducing the percentage of accuracy somewhat. Population estimates were secured by the same intensive "strip" method developed and employed by New York State in connection with its ruffed-grouse investigation, thus assuring a 100-percent coverage of the entire area (the men working from 20 to 50 feet apart, depending upon cover). Since time permitted

covering the area but once the figures are of necessity somewhat inaccurate.

Quail increased to an estimated population of 2,000; 45 grouse were located, and 75 pheasants. While unquestionably the original population was materially augmented by influxes from adjacent territories, liberations of quail and pheasants to the extent of 225 quail in 1934, and 825 in 1935, made up the greater bulk of the increase. Pheasants to the number of 100 were liberated on the area in 1934. It is rather encouraging, however, to note not only a definite increase in the number of birds over and above those resident in 1934 or liberated on the area since then, but also to find that those which have been liberated have spread to every part from the original liberation points. The fact, too, that the area today is apparently maintaining a population of one quail to every 1.8 acres is encouraging.

Perhaps the most interesting of all the results secured to date have come from the experimental areas, however, wherein, as previously mentioned, a number of domestic and foreign grains and other food species were planted. Plots for the most part were established without a previous application of lime or fertilizer in order to determine what might be expected of the various species tested under relatively unfavorable soil conditions in southeastern New York State. Attention was paid to the size and fullness of the seed heads produced, to the height of the stem, to stem stiffness under varying climatic conditions, and to the ability of the various plants tested to hold their seeds throughout the winter. Conditions within the experimental plot were carefully checked in September and again in the latter part of January following a 10-inch snowfall, and the results, together with some comments, are given in the following table. Since these merely cover one season, it is to be expected that some variation from the above will occur year by year, and the experiments are accordingly being continued.

TABLE I.—*Some characteristics of grains and other food plants as planted on the Camp Upton quail management area in the spring of 1935*

Species	Characteristics				Remarks
	Size of head [1]	Height of stem	Stem-stiffness [1]	Ability to hold seeds [1]	
Buckwheat:		*Feet*			
Common	G	2½	FS	E	Plant late
Japanese	G	2½	FS	E	
Silverhull	G	2	FS	E	
Tartary [2]	G	2½	FS	E	
Millet:					
Golden	G	3	S	E	Best.
German	E+	3½	S+	E	
Japanese	E	3½	FS	E	Adapted to wet sites.
Hungarian	F	2½	S	E	
White Wonder	G	3	S	E	
Common	G	3	S	E	
Early Russian	F	2	S	E	Early maturing.
Hog millet	G	3	NS	F	
Proso	G+	2	NS	G	Early maturing, also incorrectly called "hog millet."
Lespedeza:		*Inches*			
Harbin	F	6	NS	F	Fall feed.
Korean	NO	5	NS	--------	Did not seed the first year.
Serecia	NO	6	NS	--------	

[1] E, excellent; G, good; F, fair; NO, no head; S, stiff; FS, fairly stiff; NS, not stiff.
[2] Best.

TABLE I.—*Some characteristics of grains and other food plants as planted on the Camp Upton quail management area in the spring of 1935*—Continued

Species	Characteristics				Remarks
	Size of head [1]	Height of stem	Stem-stiffness [1]	Ability to hold seeds [1]	
Sorghum:		*Feet*			
Early amber sorghum	G	4½	S	E	Should be cultivated.
Kafir corn	E	4	S	E	
Broom corn	NO	4	S		
Spring small grains:					
Ithaca oats	F	2½	NS	F	Not recommended.
Upright oats	F	2½	NS	F	
Spring wheat	F	2	NS	F	
Spring rye	G	2½	FS	G	Best of this group.
Soybeans:					
Manchu	G	3	S(?)	E	High protein feed.
Wilson	NO	2½			
Cayuga [2]	G	2½	S	E	
Corn:					
Golden Bantam	F	4	S	G	Needs cultivation.
Golden Glow	G	5½	S	E	
Cornell no. 11	G	5½	S	E	
Flint [3]	G	5	S	E	
Sunflower: Mammoth Russian.	G	6	S	G	
Sudan grass	E	4½	S(?)	E	
Hemp	G	4½	S	E	Should be cultivated.
Canada field peas	G	3	NS	F	Fall feed.
		Inches			
Sesbania	NO	10			Did not mature.
		Feet			
Flax	G	3	S(?)	G	

[1] E, excellent; G, good; F, fair; NO, no head; S, stiff, FS, fairjy stiff; NS, not stiff.
[2] Best.
[3] Seed keeps best.

From working with the above-listed plants in the experimental plots, on the basis of preference and availability, the following grains among those tested seem best adapted to the sterile soil and the climatic conditions of southeastern New York:

For late spring and summer feeding.—(1) Winter rye.

For fall feeding.—(1) Tartary buckwheat; (2) Japanese millet; (3) proso.

For winter feeding.—(1) Golden millet; (2) Tartary buckwheat; (3) early amber sorghum; (4) spring rye.

It is not within the intended scope of this paper to discuss in detail the expected cost of maintenance of this area, pertinent as the question must be. In passing, however, it is interesting to note that a quick compilation of expenses for maintaining food strips, seed, patrol, regulation of shooting, upkeep and maintenance of equipment runs to $1,275 annually. If, as indicated by the present population, a quail to every 1½ acres can be maintained on the area, allowing at best a shootable surplus of 1,000 quail, the cost per bird would be $1.27. This allows for no amortization of the cost of development. Neither, however, does it take into account the value of the forest products which may eventually be harvested from this area. As an experimental area Camp Upton should remain definitely productive of management information for some time to come. As a straight business proposition it remains for those better versed than I to figure out whether the recreation thus offered, the decrease in hunting

pressure on surrounding lands, the opportunity to enjoy quail on toast, the bringing back of otherwise nonproductive land into definite productiveness, and a host of other intangibles, are worth the cost.

Coordination of Farm-Game Management With the Usual Farm-Game Practices

(By H. O. Ruhl, superintendent, game division, Department of Conservation, Lansing, Mich.)

This paper is intended to apply particularly to the agricultural portion of the Lake States, and more specially to Michigan.

While some lands in the Farm Belt are being managed primarily for wildlife and recreation, it seems unlikely that much good farm-game land will receive such treatment for many years. It would appear that wildlife on farm land must exist incidentally to farm practices and usually in spite of them, unless game management can be coordinated with farming operations so that it will be understood readily, appreciated, and approved by farmers. Evidences of this need frequently have been presented before the American Game Association.

During the 1935 conference, H. M. Wight, of the University of Michigan, said: "It only seems appropriate by way of introduction to reiterate the belief that I have been emphasizing for several years that we are not likely to get game management practiced in a big way unless it is eminently tied in with many other important aspects of land management." Fred Brenckman, the Washington representative of the National Grange, made this statement in 1934: "It must, of course, be understood that any policy for replenishing and maintaining the supply of game in the country depends upon securing the wholehearted support and cooperation of the farmers." In 1932 Chester H. Gray, of the American Farm Bureau Federation, discussing ways and means of getting the farmer interested in the game problem, said: "Everything that the Agricultural Extension Service does is designed to make agriculture more profitable."

In the past the game management which existed usually was initiated by someone who understood hunting and perhaps wildlife needs, but who did not understand the farmer or farming codes. Examples of this are such recommendations as the leaving of strips of hay and food patches on the east side of hedge rows where they would be covered by drifting snow, the substitution of grasses for legumes in the crop rotations, the utilization of more slowly maturing hay crops, and the leaving of uncut strips of hay or grain of sufficient size which, if harvested, would provide ample food for an additional head of livestock on the farm. Such recommendations tend to invalidate the farmers' acceptance of game management. Most initial management practices have failed to secure adequate farmer support and have dwindled as soon as the special arrangements terminated.

It is my opinion that the coordination of wildlife and ordinary crop interests must come from the farmers rather than be imposed upon them by sportsmen or others on the outside. Agricultural methods that materially benefit the farmers by lowering costs of production and incidentally aiding wildlife should, whenever possible,

replace the old systems. The techniques must be developed by interests definitely friendly to the farmer, tested at a new type of wildlife experiment station, and the results demonstrated and relayed through farm papers, agricultural extension agents, and those who are responsible for the whole well-being of the farmer.

Up to this time most of the farmer efforts relating to hunting have been to control nuisance trespass. In spite of legislation making it a misdemeanor to be hunting on any farm without the consent of the owner or caretaker, nuisance trespass still continues to be the outstanding farmer-hunter problem in Michigan.

The formation of the widely accepted Williamston type farmer hunting exchanges appears to have minimized vandalism and friction between farmers and hunters where it has been tried, but as yet only about 20 such organizations exist in our State. While this type of exchange has done remarkably well, we cannot recommend it as a permanent "cure-all". Farmers cannot be expected to maintain a large wildlife crop until a satisfactory method of harvesting the crop can be found—simple, inexpensive, effective, and fair.

The extension of the Sunday hunting ban and the posting of farm lands seem likely to continue and spread unless the reliable sportsman and the reasonable farmer can get together and "pinch out" the irresponsible hunter. Williamston type projects and group hunting clubs seem to offer the only promising solutions of this problem.

The essential features of the Williamston projects are that they are farmer-generated, farmer-controlled, simple, informal, inexpensive, and not radical.

At present there does not exist a sufficiently tested and well understood group of facts regarding the relationships of game management and agricultural production. While progress has been made with some species, it is still inadequate and the whole range of effectiveness of management has hardly been sampled. Before such coordinated practices can be initiated effectively, it will be necessary to work out practices which are biologically and economically sound. These practices must be understood clearly so that when applied under given farm circumstances they will produce a definite, measurable, and fairly predictable additional supply of wildlife or recreation and on a basis comparable to the results expected from usual agricultural endeavors. The correlation and application of pertinent information already accumulated by entomologists, pathologists, agronomists, horticulturists, and wildlife experts is a tremendous job in itself. Any recommendations that are made for game management should consider and balance all the aspects of the proposed practices and from all angles.

Strips of permanent sod bordering wood lots have harbored enough June beetles to ruin completely a stand of timber in a few years. Cedar planted as cover in the vicinity of orchards may ruin completely a crop of apples by the spreading of rust. A long parade of such examples could be found by investigation.

In Michigan a number of farm operations that are definitely advantageous to wildlife and which will lower the cost of producing merchantable crops have been found practicable. For some unknown reason these methods are little used. Such practices include the use of small combines or headers, the hogging down or picking

of corn except where the corn borer is a menace, and alternation or rotation of pastures. Foresters also have demonstrated and recommended that farm wood lots be kept free from grazing by livestock for the good of the timber. The elimination of grazing in farm wood lots would permit thousands of acres to grow excellent wildlife cover where it is needed badly.

Food patches requiring seeds not usually produced on farms and often not available from local elevators are not likely to be established by farmers so regularly as patches using the more available farm-grown seeds. It will be easier for the farmer to leave a small portion of the regular crops along the swale, such as corn and other grains, than to make an additional seeding of a special crop during his rush season. The use of small grains or grasses sown in the corn just prior to the last cultivation and left to mature for ground feeding birds will be much easier to handle than a special additional job.

The question of fence row, ditch bank, and roadside cover in relation to wildlife has many angles which need attention. In addition to the biological factors that adversely affect farm crops there is also the weed factor to consider. Noxious weeds have increased in Michigan during the past few years and perhaps much of the recommended "clean farming" can be traced directly to the damage caused by their presence. Roadside cover has furnished considerable discussion concerning its merits for wildlife and aesthetic enjoyment as well as from the standpoint of traffic safety. Does roadside cover bring wildlife out to the road and to its doom? How should we weigh the aesthetic enjoyment of effective roadside shrubbery and what portion of the cost of such highway development should be borne by travelers?

The use of cooperative farmer-controlled management areas for experimental work usually proves unsatisfactory because the records of hunting use and success are loose and uncheckable. The attitude of some farmers on the area, poaching, inability to control dogs and cats, shifts in farm ownerships, and group objectives, local jealousies, and the like so confuse an already complicated problem that it usually is impracticable, if not impossible, to isolate any given series of factors and work out their relationships.

Fundamental and biologically sound practices cannot, in my opinion, be expected reasonably until adequate experimentation and controlled experimental plots are available upon which the coordinated projects can be worked out. For the most part these experiments should draw upon foresters, conservation departments, zoologists, and ecologists as well as the existing agricultural experiment stations. I have in mind an experiment station of several thousand acres so that it would embrace the home range of most resident wildlife species, having environmental conditions comparable to those of the area that it is to represent, so equipped and financed that the most comprehensive research could be launched under actual agricultural conditions and coordinated by the best-trained personnel obtainable. This experiment station should be owned and operated by the State and supervised by practical ecologists. Many of the present State game farms might continue to serve a useful purpose as a nucleus for such experiment stations.

After these new experiment stations have worked out beginning policies, the practices must be tested on hundreds of farms and by hundreds of landowners before they should be considered as adequately tested and tried. Can you name such an experiment station properly equipped, with sufficient personnel, lands, and funds to work out these essential problems?

Let us assume that adequate information which is biologically sound from a wildlife and agricultural point of view will be developed presently, that the results are fairly predictable and the anticipated costs of production are known. Will widespread application of wildlife management develop a surplus, sending profits toppling as in the case of overproduction of other standard commodities? Is there a demand for wildlife services at a price above the cost of production which is sufficient to absorb the potential crop? What about competition with free hunting in the nonagricultural public lands in the north, such as we have in Michigan? At present there is considerable doubt as to whether any large portion of the hunting public is prepared to pay a reasonable price for the cost of producing an increased wildlife crop. We are yet so close to the so-called free hunting system that it may be many years yet before a general public understanding of the costs involved in producing a crop of wildlife is realized.

The limitation of agricultural crop production and the retirement of submarginal land offers an encouraging opportunity for dedication of such land to wildlife production. Hunting should not compete seriously with meat production. So far, crop, hog, and other reduction programs have not been adjusted readily to this rededication because of the newness of the regulations, but there seems to be no reason why such programs, if continued, should not be shaped to stimulate wildlife management.

Until a well grounded farm wildlife science can be developed, tested, and demonstrated, it seems likely that clean farming will continue to be the badge of a thrifty farmer. Ragweed and foxtail in the corn and elderberries in the fence corners will continue to be "poor housekeeping." Most game management on good farm lands will be a sentimental affair rather than a business proposition and likely to "pass out" as soon as the thrills of a new hobby have worn away.

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DISCUSSION

Mr. Corcoran (New York). Have you ever determined any compensation for the farmer?

Mr. Ruhl. Most of our experiments are so new and apparently contradictory that we do not know what the costs are—will not know until we have experiments running some years.

There are other factors besides food and cover that we cannot analyze.

Mr. CORCORAN. Would it be your idea that the State should put up the money, or the sportsman?

Mr. RUHL. I think that it should be done by individual association rather than through a third party.

Mr. CORCORAN. What is your license fee in Michigan?

Mr. RUHL. Small-game hunting and trapping, $1. This does not include deer, muskrats, and beaver.

The CHAIRMAN. Mr. Ruhl's paper gives ideas that have been in my mind for some time. I think that the situation with regard to the farmer-sportsman relationship is confused. We hear much about projects in advance, but gradually the publicity dies out, and as to final results nothing is said. In other words there is considerable advance ballyhoo, but little in the way of results. In time something satisfactory may be worked out, but as Mr. Ruhl has said, probably it cannot be done by any forced or sudden process.

Mr. CHARLES O. HAYFORD (Tennesseee). I would like to know what, in your opinion, the farmer owes to the sportsman.

Mr. RUHL. Nothing, as a farmer.

Mr. HAYFORD. That is my opinion, but most sportsmen think they have an absolute right to go on any farmer's land.

Mr. RUHL. The farmer owes no more to the sportsman than I owe to my neighbor to walk across my lawn. The hunter may take the privilege, but he has no right.

Mr. W. E. BURLINGTON (Montclair, N. J.). The question was asked as to what degree the farmer depends on the sportsman. I do not agree that the farmer owes nothing to the sportsman. Through the sportsman's $1 or $2 license for 30 years we have brought back game into New Jersey, which has been a great deal of help to the farmer. We have taken over one-fiftieth of the State already and have not paid the farmer a cent. He likes it. The farmer is willing to let the sportsman hunt, because we guarantee protection around his home or on about one-fifth of his ground. So I do not agree that the farmer does not owe the sportsman anything.

The CHAIRMAN. Do you think your experience has been long enough to indicate whether this relationship is going to continue to be satisfactory or is it still in the experimental stage?

Mr. BURLINGTON. We experimented with 50,000 acres the first year, 90,000 the second year, and today we have 170,000 acres; 80 percent of the farmers have played square. Each has agreed tentatively to allow us to use 10 or 20 acres, according to the size of his land. Charts are usually kept telling how many men have hunted and how much was killed. A great many people who have had open ground for years wish us to take them over, but our rule is that we take nothing over except that which has been posted previously.

Mr. HAYFORD. What does the farmer get out of it in the way of compensation?

Mr. BURLINGTON. No money. Just protection around his home and cultivated fields. The farmer is usually a sportsman himself in New Jersey. He kills as much game as the sportsman and without a license.

Mr. RUHL. On the question as to whether the hunter has any rights on the farm: In New Jersey the control of trespass is still up to the landowner—in other words, the hunter has no right to go on the farmer's land?

Mr. BURLINGTON. No; except when permission is given him. There are 4,000,000 acres of hunting ground—2,000,000 posted, 2,000,000 open.

Mr. HAYFORD. As to the $2 license fee paid by the sportsman. The farmer realizes the advantage of having quail on his farm and the good they do for his farm. Originally New Jersey and other States had sufficient game. This game was not depleted by the farmer but by sportsmen, and the sportsman owes that license fee to protect the game for the farm.

WILDLIFE AS AN AGRICULTURAL RESOURCE

(By WILLIAM A. SCHOENFELD, dean and director of agriculture, Oregon State College)

In addressing you today on the subject of Wildlife as an Agricultural Resource I speak as a representative of a State which has been identified primarily with agriculture since the days of the early pioneers. When the covered-wagon trains divided after the discovery of gold in California the plow was set down to mark the trail to Oregon, indicating that it was a land of opportunity for those who intended to establish homes rather than seek sudden riches. Perhaps it is fitting, therefore, that Oregon should early be concerned with coordinating the present Nation-wide movement toward the conservation of wildlife with the State's agricultural industry, which is the basis of its prosperity.

Other speakers on this program have pictured to you the emergency nature of this movement to preserve the remnants of our abundant heritage and restore to a permanent basis our priceless wildlife resources. Therefore I shall begin with the idea that the necessity for such a Nation-wide movement is unquestioned. We have also discussed the necessity for and methods of obtaining coordination among the many private, State, and Federal bodies interested in the wildlife conservation movement.

It shall be my purpose to point out that a vital aspect of this whole program is its relationship to agriculture in the sense that wildlife is a positive resource of the farming population. To the extent that these other agencies interested obtain the cooperation of the farmers of the Nation will the ultimate aims of our wildlife program be achieved.

In Oregon, and I feel sure elsewhere, wildlife and agriculture on public and private lands cannot be divorced. They are inseparable by nature and the problem is to conduct the two in harmony and to their mutual benefit. The problems of agriculture must be fully realized by those administering the wildlife resources if game and fish management are to be effective. Furthermore, if wildlife is to be produced jointly with the various forms of agriculture, including forestry, it is important that game production, through management, be approached in the same spirit and by similar methods as are used with other phases of agriculture. Wildlife management is the production of sustained annual crops of wild creatures in harmony with the major economic uses of the land.

In making effective any program for adding wildlife production to our other agricultural enterprises, several definite steps, it seems to me, are essential. First, there must be created favorable public

sentiment, both among farmers themselves and on the part of the general public. To do this will require considerable change in the thinking regarding many formerly accepted practices, both by farmers and sportsmen.

Another step will be the training of a sufficient group of men who can be used throughout the country in giving specialized guidance to rural and urban people alike in their handling of the wildlife problems.

The third step, which must be taken coordinately with the other two, is the carrying on of a strong research program to add to the present knowledge of wildlife management. This will include, among other elements, study of the food habits, methods of propagation and distribution of wildlife, and methods of disease prevention and control.

Of course, these three steps do not encompass all the problems to be encountered in transforming wildlife production into a profitable agricultural enterprise, but progress with these three is the first essential. In discussing these, it will be necessary for me to refer frequently to conditions in my own State. I do this partly because I am naturally more familiar with the situation there and can illustrate my points better through the use of specific examples.

If we are to create favorable public sentiment it will be necessary first to convince our farmers of the practicability of such a wildlife program and then to show that it will be profitable both from an economic and a social standpoint. Our farmers are perfectly willing to join in any movement for the general good if they are not expected to bear all of the expense and get little if any return.

Oregon, from a wildlife standpoint, has been extremely fortunate in that it was richly endowed with a large and varied fauna, comprising approximately 200 species of mammals, more than 4,000 species of birds and the best that North America had to offer among game and commercial fish. We are perhaps fortunate, also, in that we are not so far removed from the pioneering days when game was apparently inexhaustible. We are able to point with other States, however, to disastrous practices that have denuded our fields, forests, and streams of wildlife.

Grass and trees are, from the acreage standpoint, still the chief crops on the 61,000,000 acres of Oregon's territory. Only a little more than 10 percent of this vast area is actually devoted to cultivated farms. Of some 55,000,000 acres of timber and grass land, some 32,000,000 acres, or 58 percent, are administered by the Federal Government. Another 2,000,000 acres are State and county land, and 21,000,000 acres are privately owned. You can get from this some idea of a situation common throughout the 11 Western States to a greater or lesser extent.

Most of these lands, except certain reserve areas, are used jointly by domestic livestock and fur and game animals and birds. In the absence of contemplated research, nobody is yet prepared to say what our wildlife population is, but we do know that we have 170,000 head of horses and mules, about a million head of cattle, and 2¼ million head of sheep and lambs to be provided for on our grazing lands.

Both our game and our grass have been exploited to the serious detriment of both. The encouraging thing though, in Oregon, is

that generally our most bountiful supply of game is found on areas where the landowning livestock ranchers have been in operation the longest. This type of rancher, who has his home situated on the range, is looking ahead to permanency far more than was the early day absentee owner whose entire outlook was net cash income. The present operator has pastures stocked at a rate which experience has taught will maintain rather than exploit his property. He has water, a year-round feed supply, and has his range well salted, thus providing an ideal game-breeding ground.

I do not mean to say that all of our livestock areas are now handled in this excellent manner, but we have outstanding instances which show the possibilities of such management. The famous Izee mule-deer hunting grounds in eastern Oregon provide a specific example. The ranchers in this locality obtained title to excellent grazing areas many years ago. They also enjoyed their hunting, and today they pride themselves in saying, "We never waste a pound of meat." From the first these men hesitated to allow indiscriminate hunting on their grazing lands, and thus followed a modified game-management plan of their own.

Observation has shown that a normal crop of game in no way interferes with the livestock and, likewise, the big increase of game in this area shows rather conclusively that the livestock did not interfere with the normal crop of game. The game animals wintered mainly on browse and the livestock mainly on dry grass and hay with some browse. The livestock could not be forced to eat enough of the game food to eliminate it without severely setting the livestock back. In the early spring season, when game competes to the greatest extent with livestock, the game demands are seldom enough to cause concern.

Thus, today, the cattlemen of this community are not only harvesting a crop of livestock but are also reaping a crop of game which they unconsciously harbored while protecting their private lands. These ranchers are in no way criticizing a balanced game increase, and the sportsmen find the community a deer-hunters' paradise.

I do not mean to imply that the management of large game in conjunction with livestock farming is everywhere a simple matter. Far from it. There is a distinct problem to be faced in connection with the Federal game reserves. It is sometimes considered enough to set up these game reserves on summer range without regard to necessary winter feed. If we are to set up the game refuges on summer range, the surrounding farmers believe that it is also the responsibility of those in charge of the refuges to provide a year-round supply of feed for the increasing wild animals, rather than to force the already hard-pressed ranchers into wintering the game. Strong public sentiment favorable to game management in connection with agriculture can be created only if we make sure that justice is done to all concerned.

So much for one aspect of the situation in the range country, about which much more could be said.

Of wider application, of course, is the problem of game production on the general farms. It is most important in the agriculture of the entire Nation. If the ordinary sportsmen had to depend on gaining their recreation on the public domain far distant from settlement, the great majority would have no such opportunity. Even today the majority of the wildlife which lends so much to sport lies on farm

ground, and so we find that our far-seeing farmers, who as a class are very practical people, are looking to the possibilities of adding wildlife to their other paying crops. They are not expecting to find a source of great monetary return from the wildlife crop, but if they can get a reasonable return, such as may aid them somewhat in meeting their taxes, they are willing to consider the extra effort worth while in the interests of the general good.

I assure you that even now this is a live subject in many parts of our State, and it is being discussed in many of the county agricultural outlook conferences in progress in Oregon this winter.

Although our leading farmers are becoming conscious of the possibilities in this field, there are many misconceptions that will have to be corrected, both among rural folk and among the sportsmen, if a wildlife program is to succeed. A great majority of farmers still do not fully realize what an economic asset a reasonable wildlife population is, aside from direct returns. As has been brought out recently, they often fail to recognize the value of wildlife in controlling insects, destructive small animals, and weeds. They are inclined to lay more stress on the small amount of crop that is damaged at seeding and harvesting than to see the good work that is done in the remaining 42 to 48 weeks of the year.

It is our belief, however, that, given properly trained leaders, we can show our farmers how to aid in building up a game population so attractive to hunters that the latter will be glad to pay for the privilege of hunting. Then farmers will find their otherwise unharvested lands giving a substantially better return.

Oregon has been seeking substitutes for surplus crops since prices of wheat and other products began to tumble at the close of the war, but it is only since the experiences of the depression that the real possibilities in the wildlife program have been given wide consideration.

Among our problems in getting farmers to add wildlife to their cropping systems are those of bringing about new conceptions of handling farm and range lands. The age-old custom of uncontrolled and unsupervised burning over land at frequent intervals is neither good farming, good forestry, nor good game practice, but it is deep-seated in many sections where it is justified as having been handed down from the days of the Indians.

We also must be able to convince the farmers that it is not a disgrace nor a menace to their other crops to leave natural cover, such as are commonly called "dirty fence rows", as a source of food and protection for game.

Oregon has produced at least one specific example of the possibility of combining game production with general farming. In the 1880's the China pheasant was introduced into the Willamette Valley, and after a few unsuccessful attempts this bird obtained a strong foothold and increased rapidly. Now it is possible for sportsmen to take hundreds of thousands annually without depleting the supply. Unfortunately, however, the development of the China pheasant population was unconnected with any means by which the farmers could be rewarded for providing support for this game throughout the year.

Wildlife is a natural crop which can be aided through various artificial means, but if the natural program of reproduction breaks

down the results are not satisfactory. In Oregon the natural state of wildlife, such as this China pheasant crop, is on farm land, but until recently there has been little incentive for the farmers to do those necessary things which will encourage game production.

Recently, however, Oregon with a few other States has adopted the script plan through enactment of such a law by the legislature. Under this plan the individual who has game birds on his property can petition the State game commission to consider his land as a private shooting area. A hunter can go to the game commission office and acquire script, which is sold at 50 cents a ticket. Then the sportsman can go to a farmer that he knows is operating under the plan and seek the privilege of shooting upon his ground that day. If the hunter obtains the birds he seeks he returns to the farmer and gives him a script ticket for each bird shot. While the face value of these is 50 cents, the farmer receives only 45 cents, the remainder going to the game commission as an operating fund to administer the work.

As you see, no farmer can expect to get rich from such a plan, but it accomplishes the two important things of first providing him with an incentive for conserving wildlife, and, second, giving him better control of the hunting on his own property. On the other hand, it provides a means whereby the honest sportsman can expect to find reasonable success at nominal cost.

Before leaving this matter of creating public sentiment, I would call attention to the opportunities in adding wildlife conservation to our already broad 4–H club program. I am informed by our State club leader that this is an entirely practical project for the 4–H program, and it is even now being adopted in some States where the game commissions are paying club members for raising birds for later release. Club members who have reared wild birds for one or more seasons and studied their habits and their benefit to agriculture, will be friends of wild birds throughout life and will directly or indirectly educate other people in this movement.

On the problem of creating a training force capable of leading in wildlife conservation on the farms and elsewhere, I need add but little to what has already been said in this conference. As you know, Oregon State College is one of the land-grant institutions chosen for the establishment of such a training center through cooperation of the Federal, State, and college agencies. We have found that the training thus afforded is meeting a demand far greater than we had ever anticipated. Students are enthusiastic in the work and are putting their utmost energies into preparing themselves for this new profession.

As stated in a recent article in one of our national magazines, wildlife management has emerged as the logical successor to the obsolete restrictionist theory. The new program of education has only begun, and it will be handicapped for some years through lack of trained wildlife technicians, but it is definitely on its way, and we can be sure that just as modern agriculture required the leadership of agricultural science, so will success of modern game management on the farms and elsewhere await the development of trained personnel.

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Panoramic view of Malheur Migratory Bird Refuge, Oreg. (Biological Survey photo.)

2059

A, Ducks at Blackwater Migratory Bird Refuge, Md. (Biological Survey photo.)

42675A

B, Fox in the Cibala National Forest, N. Mex. (Forest Service photo.)

Coincident with such development must be carried on adequate wildlife research, much of it directed toward the practical problems of the farmer in his new venture. To be sure, there is much related information available which can be assembled and applied in this field. For example, we in Oregon are developing a new variety of wheat that grows under the many conditions found throughout the State. The particular value of this wheat is that it can be grown on waste patches and allowed to stand as a source of food for birds throughout the year. It is peculiar in that it has glumes adhering so closely to the seed that the ripe wheat can be put twice through a thresher without removing all the grain from the straw. We are also making a study of seeds produced by various perennial weeds and plants to see if they are valuable in this connection.

For the migratory waterfowl food Oregon has several valuable wild plants that are abundant seed producers. In this connection, it will be important to see that migratory refuges are handled in such a way that the birds do not become a menace to adjacent farming areas.

Another field of research which is closely related to the agricultural industry is that of disease control, yet it is one that has received surprisingly little attention. Disease has always been considered a limiting factor in our livestock industry, and important enough so that an organization of 2,000 specially trained Government men are dealing with it every day. Yet there is a serious disease problem in the wild-animal world which receives almost no attention.

In order to cope with this we need to have men trained in this particular branch of veterinary science and see that their work is coordinated with that of the present agencies concerned with domestic animal disease control. This would seem to be a field belonging peculiarly to the veterinarian rather than to the zoologist or biologist.

The existence of disease among wild birds and wild animals not only constitutes a menace to their production, but endangers domestic animals on the farms. Perhaps no phase of wildlife offers a more favorable opportunity for practical control of disease than the game-bird field. Artificial incubation and rearing and the application of genetic principles should provide an extremely important means of preventing game-bird losses and the dissemination of disease to poultry flocks.

In conclusion, I would like to point out that wildlife as an agricultural resource fits in admirably with the Nation's progress toward agricultural adjustment through a long-time program of soil conservation. If the adjusted acres in the new agricultural stability program can be made into a food resource for game, we will not only have made substantial progress in wildlife conservation, but will have developed a great new social and recreational resource for the days ahead when we are told that shorter working hours will provide opportunity for more healthful use of leisure time.

I can see no conflict between wildlife conservation and agriculture, because they can be made integral parts of the same industry.

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DISCUSSION

The CHAIRMAN. Our program shows that there was to have been a paper by Mr. H. L. Stoddard, Thomasville, Ga., on "Game management demonstration areas." Mr. Stoddard has been very busy showing a group from the Biological Survey around, and he felt he was unable to prepare a paper on this subject. Do you wish to say anything on this, Mr. Stoddard?

Mr. H. L. STODDARD (Thomasville, Ga.). I would like to write something on this important subject but in view of the fact that I had no time, I declined to do so by return telegraph. I had two other papers to prepare within 24 hours of my departure.

As to game management demonstration areas, I have held from the first that the people engaged in the various projects and making studies should interpret their own results and prepare their own reports.

The CHAIRMAN. Are you thinking about game-management demonstrations projects in general or some particular series?

Mr. STODDARD. The series undertaken by the United States Biological Survey and the American Game Association Game Commissions. These were set up in 1930–31, with some eight or nine projects. Due to a combination of circumstances, some of these excellent projects fell by the wayside. Two in Arkansas concluded their studies and some have continued the work. The project in Oklahoma on the prairie chicken and quail I hope is only temporarily discontinued; it is a most excellent project.

The CHAIRMAN. I was connected with the organiation and supervision of these projects. Probably the depression had a lot to do with the rather unsatisfactory course of events in connection with the nine projects. It must be said that only two have produced satisfactory results, but unfortunately both could not be carried on as hoped for at the beginning.

It seems to me, among the factors necessary to insure success in such undertakings, is the use of the greatest care in selecting the area on which work is to be conducted, and after that the choice of the superintendent. Technical inspection of the area should be as frequent and complete as possible, and in every case should be accompanied by a report on the area and suggestions for further action, not only to aid the superintendent, but to keep sponsors informed and interested. One of the most essential things is record keeping. It was very difficult to get some types of practical men to see the importance of record keeping. Even if they do see it, they have no taste for it. Good records are necessary, however, for success.

I might mention briefly factors that contribute to failure. Some superintendents are incorrigible in regard to some particular feature of game management. That is, often enough to break the project. It cannot be carried on as an experimental or scientific work unless conditions laid down by biologists are carried out.

Another thing is changes in the personnel and policies of sponsors, especially when an organization, particularly a politically appointed State game organization.

In spite of these factors, I think above all others, the one most essential to success of a project is the selection of the actual working

superintendent. If you can find a man active, intelligent, and devoted, you will attain at least a limited success. But there will be greater results if that man is actively supported by the sponsoring organization.

The CHAIRMAN. We have with us the superintendent of one of the two projects that made the best showing of this series to which we now refer, and I think he exemplifies most highly those qualifications of superintendent which I have mentioned.

Mr. Davison, will you give us the results of your work with the lesser prairie chicken in Oklahoma?

Mr. VERNE DAVISON. One of the outstanding things about the prairie chicken is that the males habitually assemble each spring morning in such manner that we can easily count the actual number of cocks on any area.

Those of you who saw the pictures at the banquet saw some of these birds in action on the gobbling grounds. We can know accurately as a basis for our management work whether population is increasing or decreasing.

We could not during our investigations find out accurately the number of hens we have, but during June, July, August, and September we were able to handle about 2,500 of these birds, about 1,700 of which were young birds we could sex.

In 1933 we have 140 cocks to 100 hens; this year we had 151 cocks to 100 hens.

The CHAIRMAN. The necessity of accurate counting is obvious when seasons or bag limits are set on the basis of such information. Estimates as to the number of prairie chickens on the Davison ranch experimental area varied from 25,000 to 100,000, and were used as the basis of trapping operations. As a matter of fact, there were probably not in excess of 3,000 birds on the tract.

THE C. C. C. REHABILITATES WATERFOWL HABITAT

(By W. F. KUBICHEK, United States Bureau of Biological Survey)

The Civilian Conservation Corps camps attached to the Biological Survey are performing a very important part in the establishment of our migratory-waterfowl refuges. Without this help, certain important phases of development would have gone undone. The understanding and cooperation of the camps in our program of rehabilitation are highly gratifying.

The past summer and fall saw the completion of many dams and dikes for the conservation and stabilization of waters, without which it would have been impossible to maintain waters in which desirable aquatic vegetation could maintain itself. In many cases these impounded waters will cover areas which, in the memory of man, have never been permanently inundated.

In preparation for this permanent water, a great amount of work is necessary in the basins. While the dams and dikes were being completed, many islands and hundreds of fish shelters were in the process of construction. The islands are so placed that they will offer the greatest resistance to the predominating wind and wave action, which if unabated would not only keep the waters roily, making plant growth impossible because of the inability of suffi-

cient light to penetrate, but would tear out any plants that might establish themselves in the shallow water and that are of paramount importance in the feeding of our dabbling ducks.

While serving this purpose, these islands will also make suitable resting grounds for many species of water birds. They have been planned for both uses and will be planted with vegetation suitable for nesting cover. Since small isolated nesting areas are preferred by several species of waterfowl for nesting and preening, large numbers of these small islands resembling muskrat houses are located in the shallow reaches of the areas. Island nesting removes the hazard of prowling predators.

Parts of these lakes or marshes will be sufficiently deep to harbor fishes, and in these areas fish shelters of all types are being constructed. Since the deeper waters are inconsequential as nesting grounds, fishing will in most cases be permitted under supervision and within certain boundaries and dates to insure minimum disturbance to birds.

To realize optimum conditions at the earliest time over these vast areas, we must of necessity aid nature with artificial planting. Great care is exercised in the proper selection of both aquatic and upland plants for each locality. Those plants that furnish both food and cover are given preference over all others.

When the seed of such plants started to mature, seed collection took priority over all other activities in the camps, and large quantities of seeds were obtained for spring planting on the refuges. Much of this was hand picked, but in a few instances machinery was used on dense stands, such as of wild millet and bayonet grass. The use of machinery permitted the collection of greater quantities of seeds. Often the entire heads were picked before the seeds shattered out. The subsequent drying and threshing furnished no small amount of work for rainy days when the boys were compelled to stay under roof.

To prevent heating when stored, which would have been deleterious to the viability of our seed stock, all seeds that are tolerant to total drying were spread relatively thin on floors or canvas until dry. After several days of drying they were sacked, marked with complete data, and placed in storage until the coming planting season.

Camps in which great quantities of seeds were collected constructed special storage cellars. They were excavated in the side of a hill and thoroughly reinforced to protect against a cave-in. They are provided with ventilators and doors sufficiently thick and tight to exclude rodents, which might easily destroy the entire supply of certain rarer seeds in a very short time. All the interior space except the alleys is equipped with tiers of shelves for properly stacking the seeds.

The seeds of certain plants, notably wildrice, require storage in cold water, which must be changed every few days. To obviate the necessity of carrying or pumping water, special storage cellars have been constructed on refuges that have considerable quantities of seeds or tubers with aquatic requirements. These cellars, averaging 20 by 60 feet, consist of a solid concrete floor and walls with partition, or septa, 4 or 5 feet apart. Each partition is about 30 inches high and built so that water will flow alternately over one and under the next.

The overflow on the first is near one wall, the underflow through the second is near the other wall, and so on through the cellar. Water is admitted above the maintained level and run over a screen to areate it properly. Then after passing through all the compartments, insuring complete circulation, it leaves by an opening about 28 inches above the floor. This outlet regulates the level of the water in the cellar. (The superstructure may be used for other storage as well as for eliminating light, thus retarding germination of the stored seeds.)

Each compartment will contain two screened bins projecting several inches above the water. The seeds will be stored in these bins through which fresh water flows constantly. Seed bags stored in creeks or on lake bottoms are likely to rot or be attacked by muskrats, thus entailing the possibility of great loss of seed stock. Tubers are being stored in boxes or barrels buried in mud. Those refuges on which large quantities of seeds of certain species have been collected usually have little or no need for this material; such surplusage will be exchanged with nearby refuges for their excess planting stock.

For the development of the adjacent uplands, such species of trees, shrubs, and vines are selected as will furnish the greatest amount of food and cover and are known to live under the conditions prevalent on the particular area. Fruits and seeds that persist on the plants through the winter are particularly valuable to game when snow covers the ground. Considering the total acreage habitable to upland game, it is quite obvious that it cannot be satisfactorily planted with native stock without depleting the surrounding areas. To prevent such an occurrence, nurseries have been started on a few refuges and will be extended to others. In these nurseries, seeds of the most desirable trees, shrubs, and vines are given special treatment to insure maximum viability and also protection from destructive rodents, such as rabbits and mice.

Trees removed from areas that are to be flooded are transplanted to other parts of the area or into nurseries for future planting when lands become available for development. Willow cuttings are frequently employed in erosion control; hundreds of thousands are now heeled in for spring requirements.

Well-located plots of previously broken land will be devoted to feed patches for ducks and geese, as well as for upland game. Most of the feed patches will be long and rather narrow, with grassy areas between them and preferably near good cover, for without cover a good patch defeats its purpose. A few large fields will be devoted to small grain for goose browsing; others will be developed to furnish seed for the succeeding year's crops.

Certain undesirable plants will be controlled or eradicated, if possible. Two of the most obnoxious forms are cattails (*Typha*) and reeds (*Phragmites*), for as soon as optimum conditions are realized, they would probably crowd out the desirable growth. These are present in small quantities on nearly all the refuges and require immediate and regulated burning and cutting to curtail their spread.

Since water will be permanently impounded this spring, for the first time, it is obvious that natural food now present will not be adequate to meet the needs of the ducks and geese using the area.

Fall or spring planted seed would almost certainly be entirely eaten up before it had a chance to germinate. In anticipation of such conditions, tons of screenings were collected from grain elevators and waste around threshing rigs. This has not only helped carry the birds over the severe winter, but will be made easily available to ducks in special areas in order to lure them away from the planting operations. The dams and dikes will be seeded with these screenings, which will afford soil anchorage and furnish food for birds later in the season.

In view of the fact that many camps had but little seed available for collecting, the following list speaks wells for those having material to harvest. All the camps have not as yet submitted complete lists of seeds on hand, so that the figures here given may be considerably lower than the stock actually on hand:

	Tons
Seeds, tubers, and rootstalks of aquatic plants	32.70
Seeds of marginal plants	25.73
Upland seeds, grasses, vines, and shrubs	2.23
Cultivated grain	1.50
Screenings	69.50
	Number
Willow cutting and seedlings on hand	77,000
Plum cutting and seedlings on hand	2,700
Total number of trees planted or heeled in	140,670

Contrary to a story that has received rather wide publicity, the Government does not have seeds, tubers, or rootstalks for planting in any sanctuaries, marshes, lakes, or ponds other than Federal migratory waterfowl refuges; and even then the quantity on hand will be inadequate to meet the demands of these refuges. Seed planting will be augmented during the growing season by direct transplanting of the desirable varieties that occur within reasonable radius and in sufficient abundance so that the source of supply would not be seriously depleted.

Many of the Civilian Conservation Corps enrollees are taking advantage of classes in which various phases of biology and engineering are taught. The cooperative spirit of the camps, coupled with the past season's experience and the interest of the boys in conservation, augers well for the next season's operations.

DISCUSSION

The CHAIRMAN. The Division of Migratory Waterfowl has certainly performed a herculean task, and much useful information as well as practical results may be expected from it.

FUR RESOURCES MANAGEMENT

FRIDAY MORNING, FEBRUARY 7, 1936

Chairman: Col. P. B. FOUKE, St. Louis, Mo.

Committee: FRANK G. ASHBROOK, United States Biological Survey, Washington, D. C.; WARD C. BOWER, Bureau of Fisheries, Washington, D. C.; G. E. RACHFORD, United States Forest Service, Washington, D. C.; GEORGE M. WRIGHT, National Park Service, Washington, D. C.; ERNEST G. HOLT, Soil Conservation Service, Washington, D. C.; W. J. HAMILTON, Jr., Cornell University, Ithaca, N. Y.; D. C. MILLS, 150 Lafayette Street, New York, N. Y.; HENRY P. DAVIS, American Wildlife Institute, Washington, D. C.; CHESTER GRAY, American Farm Bureau Federation, Washington, D. C.

Elsie Galloway, United States Biological Survey, was duly appointed secretary of this meeting.

Those present at this meeting in person were:

Alaska.—Frank Dufresne, Alaska Game Commission, Juneau.

Canada.—Hoyes Lloyd, National Parks, Ottawa; J. B. Harkin, National Parks, Ottawa; R. H. G. Bonnycastle, Hudson's Bay Co., Winnipeg; F. A. Harrison, Department of Lands and Forests, Halifax, Nova Scotia; Dr. T. Cameron, McGill University, Montreal.

Colorado.—L. H. Douglas, 463 Post Office Building, Denver.

Connecticut.—Donald Frothingham, Jr., Darien.

District of Columbia.—Chester H. Gray, American Farm Bureau Federation; Frank G. Ashbrook, Fur Resources, Biological Survey; Henry Davis, American Wildlife Institute, Washington; C. E. Rachford, United States Forest Service; Ward T. Bower, United States Bureau of Fisheries; Ernest G. Holt, Soil Conservation Service; George M. Wright, National Park Service; Ben H. Thompson, National Park Service; H. L. Shantz, United States Forest Service; D. D. Green, United States Biological Survey; Chas. E. Kellogg, United States Biological Survey; Wm. H. Marshall, United States Biological Survey; P. F. Burnham, United States Tariff Commission; Alice L. Brown, Washington; Clayton F. Moore, Earle Building, Washington; Carson F. Lyman, Associated Press, Washington.

Georgia.—L. M. Dickerson, 49 Hurst Drive NE., Atlanta.

Indiana.—Edwin B. Steen, Purdue University, Lafayette.

Iowa.—Robert H. Smith, 704 East State Street, Mason City.

Louisiana.—B. A. Bateman, Forestry Department, Louisiana State University, Baton Rouge; A. Morgan Brian, 713 American Bank Building, New Orleans; C. E. King, Morgan City; Henry P. Mirandona, 311 North Peters Street, New Orleans; Edw. H. Seiler, 413 Decatur Street, New Orleans.

Massachusetts.—R. E. Trippensee, Massachusetts State College, Amherst.

Minnesota.—Gustav Swanson, Department of Conservation, St. Paul.

Michigan.—H. D. Ruhl, Department of Conservation, Lansing.

Missouri.—Paul O. Peters, Raw Fur and Wool Association of St. Louis, 1819 Thurman Avenue, St. Louis; Rudolph Bennitt, University of Missouri, Columbia.

New York.—William C. Adams, New York State Conservation Department, Albany; John L. Halpin, New York State Conservation Department, Albany; Robert Darrow, New York State Conservation Department, Elizabethtown; W. J. Hamilton, Jr., Cornell University, Ithaca; Frederick M. Baumgartner, Cornell University, Ithaca; Frank C. Edminster, State Conservation Department, Ithaca; John H. Baker, National Association of Audubon Societies, New York; W. E. Sanderson, American Humane Association, Albany; Philip F. Allan, Soil Conservation Service, Ithaca; George Albert P. Llano, Soil Conservation Service, Bath; Joseph F. Bluff, representing the Governor of New York and the Raw Fur Dealers Association of State of New York, Syracuse; David C. Mills, Editorial Director, Fur Reporter, New York; Irving M. Genfan, representing Retail Manufacturing Furriers of America, New York Retail Furriers Association, and the American Trappers Association, 1451 Broadway, New York.

New Jersey.—John M. Pancoast, Hancock's Bridge.

Oklahoma.—H. L. Whitaker, Soil Conservation Service, Stillwater; W. B. McDougall, National Park Service, 517 Braniff Boulevard, Oklahoma City.

Ohio.—C. G. Nielsen, Babridge Game and Fur Farms Co., Inc., Venice.

Pennsylvania.—K. E. Witmyer, Animal Trap Co. of America, Lititz; Arnold Nicholson, Philtdelphia.

Tennessee.—Alvin B. Hafen, Tennessee Valley Authority, Norris; Willis King, National Park Service, Elkmont.

Texas.—George W. Raborn, Orange Cameron Land Co., Orange.

Virginia.—Jordan A. Pugh III, 612 National Bank of Commerce Building, Norfolk.

Vermont.—R. P. Hunter, Director Fish and Game Service, Montpelier.

West Virginia.—J. W. Hesen, Jr., Hotel Randolph, Elkins.

Wisconsin.—A. S. Hawkins, University of Wisconsin, Madison.

Resolutions covering the subject matter of the conference were received from the following: The American Fur Merchants' Association, Inc., New York City; the New York Fur Trimming Manufacturers Association, Inc., New York City; United Fur Manufacturers' Association, Inc., New York City; Associated Fur Coat & Trimming Manufacturers, Inc., New York City; Fur Brokers' Association of America, Inc., New York City; Retail Manufacturing Furriers of America, Inc., New York City; Greater New York Retail Furriers' Association, Inc., New York City; Washington State Fur Dealers' Association, Seattle, Wash.

Letters presented from the following raw-fur collectors throughout the United States were as follows: Ernest H. Carlson, Spokane, Wash.; Raw Fur & Wool Association of St. Louis, Inc., St. Louis,

Mo.; Pennsylvania Raw Fur Dealers Association, Valencia, Pa.; Allen Lamphere, Weedsport, N. Y.; M. & M. Fox & Fur Farms, Inc., Sellersville, Pa.; The Kroger Grocery & Baking Co., Cincinnati, Ohio; Tanana Silver Fox Farm, Steamboat Springs, Colo.; Fort Scott Hide, Fur & Wool Co., Fort Scott, Kans.; Daniel Heft, Frazeysburg, Ohio; Elmer A. Straus, Los Angeles, Calif.; Creston Iron & Metal Co., Inc., Creston, Iowa; Ralph F. Martz, Clarksburg, Md.; Pan-American Fur Corporation, New York City; Jacques Weil, Rayne, La.; H. S. Benedict, Broadalbin, N. Y.; George E. Upton, Forest Grove, Oreg.; Isaac A. Schoen & Sons, Inc., St. Louis, Mo.; United Fur Ranches, Inc., Minneapolis, Minn.; W. W. Weaver, Reading, Mich.; Herbert A. Nieman & Co., Thiensville, Wis.; Harry Bourg, DuLac P. O., La.; Arthur H. Leaver, Greeley, Colo.; Carl G. Krebaum (no address); The Bismarck Hide & Fur Co., Bismarck, N. Dak.; Nieman Bros., Hamburg, Wis.; Vivian Whiffin, Caldwell, Idaho; Stavig Bros., Sisseton, S. Dak.; F. E. Powell, Wessington Springs, S. Dak.; Newt's Fur House, Neosho, Mo.; Jett Hinshaw, Carmel, Ind.; J. O. Johnson, Southington, Conn.; A. M. Knezel, Broadhead, Wis.; Leslie Kreitzer, Richland, Mo.; P. V. Lacoste & Co., Inc., New Orleans, La.; Mack, May & Co., Minneapolis, Minn.; Meyer M. Levy, Jackson, Mich.; Henderson Produce Co., Chillicothe, Mo.; R. C. Elliott & Co., Salt Lake City, Utah.

Remarks of David Mills, Acting Chairman

In calling the meeting to order Mr. Mills quoted from a letter from Col. P. B. Fouke, in which he explained his inability to attend and expressed his regret that it was impossible for him to be present. Colonel Fouke further expressed the earnest hope that the conference would result in action that would be beneficial to wildlife and to the people of the country. He also stated that he had received a communication from E. A. Stephens, of Denver, Colo., authorizing him to speak for E. A. Stephens & Co.

The acting chairman introduced Dr. T. Cameron, of McGill University, Montreal, Canada, who presented the following paper:

The Conservation of Fur in the Northwest Territories of Canada

(Prepared at the direction of Hon. T. A. Crerar, Minister of the Interior, Ottawa, Canada)

The northwest territories of Canada comprise all that portion of the Dominion north of the organized Provinces and east of Yukon Territory. The total area is 1,309,682 square miles, and according to the census of 1931 the population is shown to be 9,723, composed of 4,670 Eskimos, 4,046 Indians, and 1,007 whites. The greater majority of these residents of the Canadian north are dependent upon the fur trade for their livelihood, while the industry itself represents a valuable asset to the Dominion. Consequently, the conservation of the fur resources of the northwest territories represents an important responsibility of the Department of the Interior.

Before the coming of the white man, the natives—Indians and Eskimos—lived wholly on the products of the chase. The northward

advance of the fur trade, with its introduction of firearms and of other manufactured goods, slightly modified the habits of the natives. However, the vastness of the country, the sparseness of population, and the realization of all concerned as to what was the basis of existence have tended to prevent the indiscriminate slaughter of wildlife.

Because for many years no other industry followed the fur trade, wildlife conditions in the northwest territories have been less affected by the advance of white population than those of any other part of the continent. The fur and game supply of the territories is still sufficient to maintain the native population, and it is only at the low ebb of cyclic fluctuations in wildlife, or when the caribou change from their usual migrational routes that the natives suffer from game shortage. In recent years the discovery of valuable mineral deposits in the territories has greatly speeded up the advance of civilization and industry into the north. The Government of Canada has kept closely in touch with the rapidly changing situation and taken additional measures to conserve the fur and game resources of this vast area. Carefully drawn game regulations have been put into force; huge game preserves have been set aside; and control measures instituted with respect to trading and trafficking in pelts.

Approximately 40 percent of the area of the northwest territories (539,782 square miles) is set aside for protection of fur-bearing animals and game animals. These reserves are of three classes: (1) Parks established to provide complete protection for certain species, but in which other animals may be taken under the regulations; (2) sanctuaries where all hunting and trapping is prohibited; and (3) game preserves where natives are permitted to hunt and trap. Parks, sanctuaries, and game preserves have been established as follows:

WOOD BUFFALO PARK

The Wood Buffalo Park (17,300 square miles) which was set aside in 1922 is situated between Great Slave Lake and Lake Athabaska immediately west of the Slave River, partly in Alberta and partly in the northwest territories. The primary object in establishing this park was to preserve in its natural environment the herd of wood buffalo which roamed in that district. Estimates as to the number of buffalo in the herd at the time the park was created vary from 500 to 1,500. In 1925 the annual surplus of the herd at Buffalo National Park, Wainwright, Alberta, was shipped to this reserve, and this plan was continued in the 3 succeeding years. The total number in the park is now estimated at over 8,500.

Wood Buffalo Park abounds in other wildlife, and beaver, muskrat, colored fox, lynx, and mink are plentiful. Beaver, especially, have increased in recent years. The killing of buffalo is prohibited, but the trapping of other animals is permitted by the game regulations. This privilege, however, is restricted to those persons who hunted and trapped in the area before the park was established.

THELON GAME SANCTUARY

Area 15,000 square miles, situated in the Thelon River district, between Great Slave Lake and Chesterfield Inlet. This sanctuary was set aside in 1927, for the purpose of conserving what, so far as was then known, was the last important herd of musk oxen remaining on the mainland of Canada. No person may hunt or trap in this sanctuary, and entry to it is prohibited except under permit from the Minister of the Interior. It was estimated there were 250 musk oxen in the sanctuary in 1929. During the past year a representative of the Department counted from an aircraft, 180 musk oxen to the north of the junction of the Thelon and Hanbury Rivers.

Under the regulations, the killing, injuring, or molesting of musk oxen in any part of the northwest territories is prohibited.

The white fox is the principal fur of the district adjacent to the Thelon Game Sanctuary and elsewhere north of the tree line.

GAME PRESERVES

In these preserves only native-born Indians, Eskimos, and half-breeds may hunt or trap fur-bearing animals. A very important feature of the regulations from the standpoint of conservation of fur is that the establishment of trading posts in these preserves is limited to the minimum necessary to provide for the requirements of the native population. No trading post may be established except under permit from the Department of the Interior, and then only at such locations as may be deemed desirable from the point of view of native welfare and with due regard to the conservation of the game supply.

ARCTIC ISLANDS PRESERVE

Area, 439,105 square miles. The Back River Preserve, which was established in 1923, now forms a part of the Arctic Islands Preserve. This preserve embraces a large part of the fawning grounds and summer range of the barren-ground caribou. The principal fur is the white fox which in normal years is very plentiful over the entire preserve. The establishment of trading posts is restricted at present to five locations within this preserve, practically the whole of which is situated north of the Arctic Circle. A few white persons, representing missions, trading companies, and Government departments, reside in this preserve. The remainder of the population is composed entirely of Eskimos.

YELLOWKNIFE PRESERVE

Area, 70,000 square miles. It is situated between Great Slave Lake and Great Bear Lake in the Mackenzie district. The southerly part of this preserve is well timbered, whereas the northerly part extends into the treeless area. As a consequence the district yields

a diversity of fur, chief among which are fox (all varieties), beaver, marten, mink, and muskrat. The central and easterly portions are prolific in game, and are traversed by the barren ground caribou during their winter migrations.

SLAVE RIVER PRESERVE

Area, 2,152 square miles. It embraces the delta of the Slave River and is situated south of Great Slave Lake. It is the hunting grounds of many of the Indian bands who reside on the south shore of Great Slave Lake. The principal furs are colored fox, beaver, lynx, marten, and muskrat.

PEEL RIVER PRESERVE

Total area, 7,300 square miles. Area in northwest territories, 3,300 square miles. Area in the Yukon Territory, 4,000 square miles. Embraces the mountain range of the Peel River district. It comprises the hunting grounds of the Peel River and McPherson Indians. The principal furs are fox, marten, mink, and beaver. Big game, such as bear, mountain goat, and caribou, are comparatively plentiful in this district.

REINDEER GRAZING PRESERVE

Area, 6,600 square miles. Situated on the Arctic coast at the mouth of the Mackenzie River. While this reserve was created as a grazing area for the Canadian reindeer herd of nearly 3,000 animals, it is also a game preserve, and, under the regulations, hunting and trapping is restricted to those who trapped in the reserve in former years. The important furs of the district are fox (all varieties), mink, and muskrat.

GENERAL

In furtherance of the policy of conserving the game supply an amendment to the game regulations was made in 1932 which has the general effect of limiting the issue of hunting and trapping licenses for parts outside the reserves to those persons who have the status of residents. The term "resident" is defined to mean "any British subject who has resided in the northwest territories for a period of 4 years."

Another amendment approved in 1932 prohibits the trapping of beaver except under permit. Each male resident over the age of 18 years is entitled to a permit which allows him to take a limit of 15 beaver each year during the open season provided by regulation. Since this policy was adopted reports have been received from many districts that the beaver population is increasing.

A further feature of importance from the standpoint of fur conservation is the regulation which requires that traders shall operate their trading posts for a period of 8 months in each license year. In order to comply with this provision the trader must erect a permanent structure in which to conduct his business. This in effect practically restricts trading to residents and to persons who enter the territories with the intention of remaining. Itinerant trading is prohibited under the regulations.

The regulations are administered on the ground by representatives of the Royal Canadian Mounted Police who are game officers under the Northwest Game Act.

The value of the fur yield of the northwest territories for the season ended June 30, 1934, as estimated by the Dominion Bureau of Statistics was $1,515,017. The yield of important furs during that season was:

Bear:	
Black	65
Brown	5
Grizzly	1
White	18
Beaver	10,504
Coyote	44
Ermine	7,367
Fisher	21
Fox:	
Blue	280
Black	15
Cross	3,668
Fox—Continued.	
Red	8,763
Silver	297
White	52,467
Lynx	4,395
Marten	5,580
Mink	16,671
Muskrat	118,537
Otter	313
Skunk	6
Wolverine	98
Wolf	550

The acting chairman then introduced Mr. R. H. G. Bonnycastle, of Winnipeg, Canada, who presented the following paper:

Hudson's Bay Co. and Fur Conservation

(By R. H. G. Bonnycastle, Winnipeg, Canada, Representing Fur Trade Commissioner, Hudson's Bay Co., Winnipeg)

Mr. Chairman, ladies and gentlemen, I have the honor to represent the "Governor and company of adventurers of England trading into Hudson Bay", commonly known as the Hudson's Bay Co., and I have come here from Winnipeg, in Manitoba, to have the benefit of listening to what you gentlemen have to say about the wildlife of this continent in which our company is so vitally interested. Probably most of you have heard of the Hudson's Bay Co. and some of you may even know something of its history. Anyway, it is the same company which came to the shores of the Hudson Bay in 1670 to engage in the fur trade of Canada and which has carried on that trade ever since. Until a few years ago we were also charged with the government and administration of a large part of Canada, but with the advance of settlement these rights were surrendered to the Canadian Government. Previous thereto the company had maintained peace in the wilderness, conducted trade without violence, established principles of justice and carried out the exploration of the country in a way that has been of the utmost service to Canada ever since.

The Hudson's Bay Co. is still primarily a fur-trading corporation. Even in these days of strenuous competition on all sides we control more than one-half of the total raw fur output of Canada which produces the finest furs in the world. Thus, as you can readily appreciate, the perpetuation of wild fur-bearing animals for the future is a matter of prime importance to us. We view with alarm the steady decrease in many varieties of valuable furs. In some cases these can be taken care of by fur farming. Silver fox and mink ranching has already been placed on a firm basis and has proved that

the decline in wild resources can be more than made good by the breeding of these animals in captivity. We know that muskrats can be conserved and raised successfully in large numbers through the control of marsh areas suited to their habits. In time there is no doubt many other animals will be added to the list of those which can be bred successfully in captivity.

The Hudson's Bay Co., however, has a tremendous investment throughout the entire northern part of Canada, right from the Atlantic to the Pacific and from the transcontinental railroads north to 500 miles within the Arctic Circle. And not only have we a tremendous financial investment which, properly handled, is expected to return dividends to our shareholders, but we have a very great interest in the welfare of the native population with whom we have lived in peace for 266 years. These people are dependent on the wild fur resources of the country. If the fur bearers are permitted to be wiped out, then the Indians and Eskimos will be left without means of subsistence because they are not suited to other occupations, such as mining or agriculture. They will become a charge on the Government, which is a situation earnestly to be avoided as being neither in their own interests nor the Government's, nor anyone else's. Proper conservation methods will take care of the situation, ensure a perpetual supply of furs from the wild, and maintain the native population.

The various governments of Canada, dominion and provincial, are keenly alive to the necessity of conservation, and many measures have been undertaken to protect our fur resources. Trapping seasons have been regulated for all valuable animals, game preserves have been set up where only natives may hunt, sanctuaries have been set aside where none may hunt and animals may breed in security. Canada has been fortunate in possessing large areas quite unsuited for cultivation or settlement, and sufficiently remote or difficult of access to conserve the fur resources occupying them. But modern methods of transportation have operated to overcome these natural barriers, and airplanes are being used to break into the last remaining breeding grounds. The result is inevitable unless vigilance is unrelaxed and the cause of the fur bearer and those dependent upon him is scrupulously safeguarded.

The Hudson's Bay Co. is deeply concerned in providing ways and means for protecting the future insofar as its fur production is concerned. Two fully modern silver fox farms are operated. One, near Winnipeg, being, in particular, one of the most modern establishments of its kind in Canada. The company at present is more concerned with breeding a first-class product than going in for mass production, but we are expanding operations in this department as rapidly as possible consistent with the quality of our product. We are also breeding mink, while experiments are being conducted with marten and fisher.

A muskrat marsh has been leased from the Manitoba Government and the rats protected for several years now with eminently satisfactory results. Negotiations are under way with several provincial governments for the securing of other large marsh areas which are expected to keep the company's great auction sales in London fully protected against any diminution in the supply of rats from the trading posts.

But the subject of our greater pride and interest is our big beaver conservation scheme on the shores of James Bay, where our ships first landed in 1670. As you know, the beaver has played a great part in the history of our country. For hundreds of years it was the staple fur, the bread and butter of all parts of Canada. The beaver is splendid as a fur-bearing animal and possesses great food value, but his habits and nature render him easily captured, while his slow rate of reproduction has marked him out as a ready object of extermination.

The area around James Bay, which is the southernmost extremity of Hudson Bay, was until comparatively recent times a prolific producer of beaver, and the Indian inhabitants a well-equipped, upstanding, and self-reliant people. Gradually, however, the beaver played out, due to various causes connected probably with increased competition amongst traders and the breakdown of the old hereditary trapping lands system. As the beaver declined, so did the morale of the Indian population. They became practically destitute, were constantly faced with danger of starvation when they went far from the trading posts, and rapidly lost their self-reliance and self-respect.

The company was faced with virtual ruination of its trade at its oldest posts and it became evident that desperate measures were necessary in order to bring the country back, provide a measure of prosperity for the people, and trade for our posts.

The result of this situation was the establishment of what we call the "Rupert's House Beaver Sanctuary." Through the active help and cooperation of the Province of Quebec, an area of 7,000 square miles was leased for a nominal figure from the Province, on the understanding that we would utilize it for the rehabilitation of beaver. We undertook to protect the few remaining beaver in every way possible, to survey the conservation, patrol it and guard it against forest fires, and for this work to employ at our own expense, from the resident population, Indian game guardians, their wages being partly a concession for the beaver they were no longer allowed to trap.

From the start the Indians were keenly alive to the possibilities in the scheme and declared themselves wholeheartedly for the conservation of the beaver, which had always been their mainstay, and left them without sufficient means of subsistence when they disappeared from the scene.

The Indian guardians whom we appointed took their duties, which are of a nature to appeal to them, very seriously, and I leave it to you to picture them drawn up for their annual inspection, clad in their uniform of windbreakers and breeches, flashing enormous enamel badges of office and clutching their commissions embellished with an impressive seal. Anyway, they patrolled the big sanctuary, made maps, marked the beaver houses on them, put out fires, and woe betide anyone who laid hands on a beaver.

In 1933 the first beaver census was taken. The count showed 38 lodges, estimated to contain 162 beaver all told, where there had been tens of thousands of beaver in former days. This indicated the seriousness of the situation.

In 1934 the census showed 93 lodges, containing an estimated total of 368 beaver, while last summer the count was 600 beaver, and before

long, with rapid increases from now on, we expect a population of 25,000.

No definite plan has yet been formulated as to whether the beaver at the end of this period will be trapped by the Indians under careful control in order to take off only the annual increase or whether possibly they will be taken alive and utilized to stock the entire country around about in cooperation with the Provincial authorities and the Federal Department of Indian Affairs.

In any case, the undertaking which now demonstrates that it will be 100 percent successful, has great potentialities and we look forward confidently to the time, not far distant, when beaver skins will again be produced in large numbers and the Indians restored to their former positions of independence and self-reliance. Already a new spirit of hopefulness is manifested among them.

Since the establishment of the Rupert's House Sanctuary, the idea has been extended to include Charlton and Agamiski Islands in James Bay and leases of both have been secured for the conservation and production of beaver. Live beaver were brought from Ontario and planted on Charlton Island with the object of introducing new blood and hastening the growth of the colony. Agamiski Island was entirely destitute of beaver and breeding stock has been transferred from the Rupert's House Sanctuary to start a colony here. We are now endeavoring to secure deer for introduction on both these islands, which we hope will result in stocking the entire neighboring country with these animals so important in the economic existence of the Indian population.

These are the main steps undertaken by the Hudson's Bay Co. to date in the interests of fur conservation, but we are constantly seeking new ideas for the perpetuation of our wild-fur resources for the benefit of Canada as a whole, the native population, and the Hudson's Bay Co.

The acting chairman then introduced Mr. Hoyes Lloyd, Department of Interior, Ottawa, Canada, who presented the following paper:

Canada's Fur Resources

(By Mr. Hoyes Lloyd, of Ottawa, Canada)

The story of the fur trade in Canada is one of romance, adventure, conflict, and even bloodshed. The early history of Canada abounds with the activities of the fur traders, for the fur trade was a vital factor in shaping Canada's destiny.

On the North American Continent the first fur traders were the French and Russian companies. The most important step, however, in the development of the fur trade of Canada must be credited to two French traders, Groseilliers and Radisson, who, in the year 1668, made their way into the wilderness beyond Lake Superior, and returned to Montreal with a load of furs. These two adventurers, after being repulsed in Paris, succeeded in interesting a few British noblemen and merchants to the extent of outfitting two vessels to proceed to Hudson Bay to attempt to tap the fur trade of the central portion of the continent by a sea route through Hudson Bay. The 2d of May 1670 saw the incorporation of the Governor & Co. of

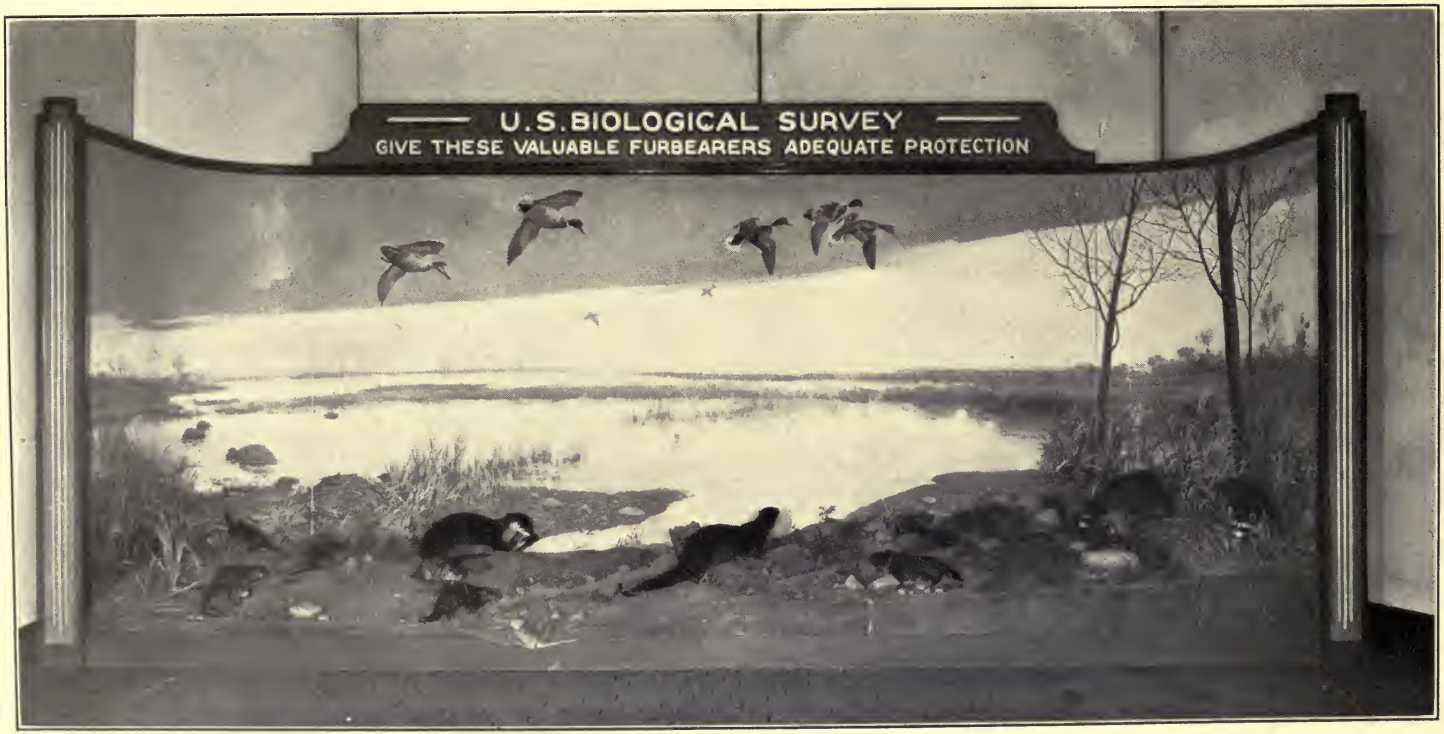

Exhibit by United States Biological Survey at the North American Wildlife Conference, showing several fur bearers that deserve protection.

Adventurers of England, trading into Hudson's Bay, which was, in later years, to become known generally as the Hudson's Bay Co., which company, it is claimed, is the oldest fur-trading company in the world.

The fur trade, which was the most important factor in the settlement and development of Canada in its younger days, has continued to thrive throughout the years, and as a national resource, the fur bearers have played their part better, perhaps, than could have been anticipated.

Although year after year great numbers of fur bearers have been taken, and although the northward advancing tide of settlement and industry has driven many of these creatures from their habitat, the supply of pelts has kept well abreast of the demand. This is due largely to the comprehensive laws enacted by the Federal and Provincial Governments for the protection of the fur bearers, the closing of seasons in some areas for certain species, the licensing of trappers, and the regulation of the trade generally.

A striking example of the benefit of international cooperation in fur conservation is indicated by the following extract from a report of the committee of foreign relations, American Fisheries Society, 1935:

> Prior to 1911 the fur seal herd that breeds on the Pribilof Islands had become almost negligible from a commercial point of view, having been reduced to a low level of between 125,000 and 136,000 animals. With a view to rehabilitating this herd the pelagic sealing treaty of 1911 was entered into by the United States, Great Britain, Japan, and Russia. As a result of this treaty the seal herd, according to the recent estimate of the United States Government, is now in excess of 1,300,000 animals, which permits of an annual take of well over 50,000 skins of surplus males.

Fifty-seven thousand two hundred and ninety-six skins were taken during the past season of 1935.

The fur trade of Canada is no longer dependent solely upon the trap line. The growth of fur ranching in recent years has been such that it is estimated that one-third of the total value of pelts produced is derived from animals bred on fur farms. There are now in the neighborhood of 7,000 fur farms in operation throughout the Dominion. Eighty percent of these are fox farms, the remainder being mink, raccoon, muskrat, and beaver farms. There are also a few farms devoted to badger, fitch, marten, lynx, skunk, coyote, and chinchilla rabbit.

The national parks of Canada are an important factor in the conservation of fur-bearing animals, and it is to these sanctuaries, and other similar reservations that credit may have to be given for the perpetuation of certain species of fur bearers; particularly ones like the marten and beaver which have reached a low ebb, and which do not stand up against keen exploitation.

The Fur Production of Canada, Season 1933–34

(From report of Dominion Bureau of Statistics, Department of Trade and Commerce)

The raw-fur production of Canada in the season 1933–34 (12 months ended June 30, 1934) had a total market value of $12,349,328, an increase over the preceding season of $2,044,174, or 20 percent, and an increase over the season 1931–32

of $2,159,847, or 21 percent. The total production comprises the pelts of fur-bearing animals taken by trappers and pelts sold from fur farms, the value of the latter constituting approximately 30 percent of the whole in each of the three seasons.

First among the various kinds of furs is silver fox, with a total market value in the season 1933–34 of $3,711,390, the fur-farming industry being the main source of supply for these pelts. The muskrat is second in importance with a total value of $1,863,322, and mink is third with $1,822,774. Fourth on the list is white fox, while patch or cross fox is fifth and red fox sixth. Combining the various kinds of fox (silver, patch or cross, white, red, and blue) the total value for the season is shown as $6,168,457, or 50 percent of the total for all furs. Beaver, which dominated the fur trade in the early years, now stands seventh on the list, having in the season under review a total value of $476,391. Increases in value over the preceding season are shown for all of the principal kinds of furs, excepting beaver.

The total number of pelts of all kinds in the season was 6,076,197, compared with 4,503,558 in the preceding season and 4,449,289 in the season 1931–32. The large increase in total is due mainly to the increase of over a million in the number of "squirrel" skins. The Province of Alberta supplies most of these squirrel skins, the average price of which is about 12 cents. Among the principal kinds of furs, increases in number are recorded for silver fox, mink, white fox, patch or cross fox, red fox, and ermine, while decreases are shown for muskrat and beaver. The reduction in the number of beaver skins is due in part to the scarcity of the animals and in part to the restrictions placed by the Provincial governments upon trapping, with a view to the conservation of this historic fur bearer.

The white fox is, of course, highly variable in population and the catch indicates this variation from year to year.

There is very reason for optimism with regard to the future of the fur industry in Canada. It is a fact that there is an ever-increasing use of furs in the world of fashion. It is hoped that through good conservation Canada will continue to help meet the demand for fine fur.

For many years a large proportion of Canada's fur was sent to salesrooms in London, New York, St. Louis, and other central markets where foreign buyers assembled, but Canadian fur markets are now playing a very vigorous part in this regard, and many fur buyers now come to Canada to buy their furs.

The acting chairman introduced Mr. C. E. King, Morgan City, La., who presented the following paper:

The Louisiana delegation at the National Wild Life Conference called by President Roosevelt in Washington this week, pledges its support in the fullest possible manner to the temporary organization, and to the permanent organization to follow:

Louisiana's geographical position is and should be of particular importance to the migratory game part of any national program and both the official departments and the citizens of Louisiana appreciate that they can be of great assistance in any migratory bird protective and restorative program which this National Wild Life Federation may enter into.

Louisiana has supplied wildlife refuges in greater scope for migratory birds than perhaps any other State in the Union. The Government is acquiring additional preserves for this purpose and much-added protection will be provided in this principal winter resting ground of the migratory birds of the North American Continent.

Louisiana, however, is no more interested in the migratory bird features of any national program of restoration and protection than it is in its peculiar situation as an industrial fur-producing State.

For many years Louisiana is known to have produced more pieces of fur than the fur-producing areas of Canada and Alaska combined and more than most of the other fur-producing States of the United States. While a conservation department has functioned in Louisiana for many years, and while conservation laws are in effect in that State, through abuse of privilege, through disease, droughts, floods, and other causes, Louisiana's former tremendous fur production, as in other fur-producing areas, has been reduced to the same plight as that of the national migratory bird supply. Reports from throughout the Nation indicate that the same condition exists in all of the principal fur-producing areas. Louisiana urges that any program undertaken by the National Wild Life Federation be made to include a thorough study of not only the migratory birds and the fur-bearing game animals, but especially regions such as Louisiana in which trapping is a major industry.

About 10 years ago, the annual production of furs in Louisiana constituted in excess of 15,000,000 pelts. Of this number about 90 percent were muskrats. The other animals included otter, mink, coon, possum, skunk, and a few scattered varieties, such as bear, wildcat, and deerskins. That peak production gave employment to about 25,000 trappers, 70 percent of which trap muskrats, furnishing them with a livelihood for themselves and their families. In addition, thousands of people in the United States at large derived their principal source of income, or a large portion of same, from the fur harvest of Louisiana.

The muskrat-producing region of Louisiana lies along its entire Gulf coast between Mississippi and Texas. It is approximately 300 miles long by 20 miles deep. This region is almost solidly marshland and is deemed unfit for agricultural purposes. Its compact, consolidated form makes it especially adaptable for repopulation through the aid of the State government, the Wild-Life Federation, with the help of the Federal Government as it may be extended through the Biological Survey.

The muskrat-producing area of Louisiana was for a period of about 2 years, ending in 1927, through the cooperation of the State conservation department and the Biological Survey, provided with a fur-research laboratory. The research at that time was discontinued because of the great 1927 flood, which destroyed the activities of that particular laboratory, which it so happened had been located within the narrow path of the flood. It is the belief of the people of Louisiana that, as one of the major natural resources, not only along the Gulf coast but in other similar areas in other States, that where any national program of restoration and protection can be furthered by the research facilities provided by the Government, and where the economic value of such section of the wildlife of the United States is so definitely and clearly established, that prompt and thorough cooperation should be reached between the States and the Government.

While the fur production of Louisiana is normally a part of the wildlife of the Nation, it cannot be considered for its social or recreational value, as it is not a matter of sport. This fact, however, should give such natural resources a preferred place, in our opinion, in the national wildlife program because of its employment value, not only to such local producing areas but to all allied interests throughout the entire Nation, which are so largely concerned.

It is the belief of the Louisiana delegation that wherever conditions exist similar to those in Louisiana that they have the attention and support of any permanent Wild-Life Federation to be formed, and that the efforts of those engaged in the fur industry in Louisiana and elsewhere may receive the fullest of support and encouragement in their desire to restore such commercial fur production and to provide necessary protection for its future. It is our belief that the fur section of the Biological Survey should be placed in position at the earliest possible moment to carry on in Louisiana the same splendid work it is doing in other fur-producing areas. Muskrat territory is more suitable to quick restoration because of the fecundity of these animals. To restore the peak production in Louisiana might be accomplished rapidly, and the success of such movement would mean lucrative reemployment for thousands of people who depend upon the annual harvest of fur for their livelihood. From the peak employment of about 25,000 trappers in the Louisiana marshes in 1923 the present crop is harvested by approximately 5,000 trappers, and their individual catch is much lower than the individual take of fur by the former 25,000 trappers.

In conclusion, it is our belief that as far as the restoration and protection of migratory game concerns the General Wild Life Federation program, that the restoration of the muskrat fur-bearing areas in the United States, and especially in Louisiana, will go far toward bringing about the praiseworthy object of the federation, because of the reemployment of the thousands of people who live along the borders of this greatest of all of the North American migratory game preserves. It has been said that a plentiful supply of fur-bearing animals means a plentiful supply of game animals and birds. Louisiana wants to work with you, and requests your cooperation in bringing about the perfection of your program.

The acting chairman then presented Mr. Irving M. Genfan, of New York City, representing the American Trappers Association, who presented the following paper:

Remarks of Mr. Irving M. Genfan, of New York City

Mr. Chairman, Friends:

I am reminded of a story about the fellow who was found unconscious on the streets of Brooklyn and was rushed to the hospital for emergency treatment. A staff of specialists were called in to diagnose the case. After a very prolonged discussion, without decision, one member of the group, who had thus far remained silent, stepped forward and said: "Gentlemen, we've spent hours discussing a case that everyone recognizes is serious. Just like the rest of you, I haven't the slightest idea what ails this man, but the necessity for doing something immediately forces me to suggest that we operate on him for appendicitis, and if that doesn't work we'll try something else."

The question of American wildlife and the problems confronting us not only warrant but absolutely demand a more thorough, more practical, and more complete diagnosis than has thus far been developed. Without this, the paramount purposes will be lost in the shuffle, and our energies will be exhausted while we wander in the wilderness of confusion.

In representing the American Trappers Association and the interests of American trappers as a whole, it is not my mission to question the sincerity of purpose of any member of the conference. Most of all, it is not my purpose to minimize or to underestimate the importance of your valued proposals. ButI do, however, feel that too little consideration has been given to what essentially must be recognized and regarded as the very foundation of any wildlife conservation program that promises any semblance of success.

Too many sportsmen seem not to realize that their immediate and future hunting grounds are out on somebody's farm. And an even larger number seem to disregard the fact that upward of 2,000,000 of these farmers and farm boys are part-time trappers. This not only means a source of winter income for these men and boys, but it must be borne in mind that without seriously disrupting the natural balance, the very nature of their work on the trapline represents primary protection for millions of quail and other wild game.

And the benefits extended to sportsmen by these farmer-trappers does not confine itself here. Not only do these farmer-trappers pay taxes on the breeding grounds of the game which you hope to hunt and bag but they also furnish the feed that brings this game to maturity. Therefore it is necessary to recognize that these farmer-trappers actually must represent the backbone of any constructive wildlife program, and any program which does not have their active support and cooperation is destined to utter failure.

While practically every trapper is a farmer, and the farmer's interests are necessarily our interests, we are primarily concerned with trapping and the fur trade as such, and with the huge benefits derived from American wild fur resources and the fur industry as a whole.

The American trapper-farmer is the foundation of the American fur industry. And not only does this industry represent hundreds of millions of dollars of invested capital but it also involves billions of dollars of direct and incidental transactions between trapper and wearer, provides cash incomes for thousands who otherwise would be on relief and likewise on the back of John Taxpayer.

How many of you ever stopped to consider the part which trapping and the fur trades have played in the making of American history? Since the beginning of our history American trappers and fur traders have been the trail blazers beyond every American frontier. Columbia River was first discovered by Capt. Robery Gray, a fur trader. That gave us the great Northwest and inspired the Louisiana Purchase. Otherwise the United States might now be confined to territory east of the Mississippi River. Always our fighting forces in the West were dependent upon trappers for guides and scouts. When the Texas revolution broke out it was those old trappers who were first to face the thrust of Mexican bayonets under the Lone Star banner. Historians speak of General Freemont as the "Pathfinder", but actually it was those old trappers who showed Freemont the path westward and led the way as guides and scouts.

I do not believe there is any conflict of interests between trappers and sportsmen, but I do believe that trappers are too often misunderstood by sportsmen. But since every trapper is, himself, a sportsman, it shouldn't be very difficult to arrive at a satisfactory understanding. Both trappers and sportsmen, however, are too often victims of unsound legislation, as well as biased or ignorant

administration of fur and game laws. Or maybe "maladministration" would be more appropriate.

Take the Biological Survey, for example. This bureau was first created for the purpose of protection and scientific administration of our wildlife resources. Somewhere down the line, however, the Survey forgot what it was created for and succeeded in convincing Congress that its proper place was in cahoots with the western sheep industry. Well, nobody has a greater fondness for spending money than a Congressman—especially other peoples' money—and since John Taxpayer is an easygoing sort of a chap, he'll take it and like it. So the Survey was given a new lease on life, a raise in pay, and was turned out with the sheep. There is a poison weed out West called "locoweed." Sheep eat this weed and go crazy; start running in circles and doing all kinds of things. Well, I don't want to enter any misleading statements here, but it has been reliably reported that the United States Biological Survey got an overdose of this locoweed.

Incidentally, the Survey has spent years and millions of dollars of John Taxpayer's money keeping western wildlife on a reducing diet. You know, just like a lot of women who sometimes go on a diet to reduce. In the Survey's case, however, they mixed too much strychnine with the broth, and as a result, western furs and birds in many sections have been reduced to a memory. This seems like carrying this reducing mania to extremes, I would say.

The Survey claimed they were doing this to save sheep. In fact, J. N. Darling, while Chief of the Survey, made a clean confession in the October 1934 issue of the National Wool Grower, and stated truthfully, that they had had the financial support of the sheepmen, only the finance, as usual, was furnished by John Taxpayer, while the sheepmen furnished advice.

Well, anyway, the Survey succeeded so well in its efforts to save sheep that the Government finally had to step in and buy several million head of sheep to keep them from starving to death. Yes; and I believe also to save an industry from ruin when it didn't have sense enough to save itself—ruining itself through greed and range destruction. And those ranges, too, by the way, for the most part also belonged to John Taxpayer. Anyway, there was only one way to save the sheep. They couldn't plow them under like they did the cotton, so they had them shot in their track. And that, too, was charged to John Taxpayer. Yes; John is quite a boy. In fact, I don't know what a lot of bureaucrats and politicians would do without him.

I am not condemning all of the work of the Biological Survey. I know of their good work. I know the work that Frank Ashbrook has been doing. I have known Frank since 1928, and we in the American Trappers' Association have followed his good work carefully. I am here at this conference to offer the fullest cooperation to the Survey. We do, however, take a definite stand against the poison policy of the Survey, and note, with much gratification, the present tendency to decrease the use of poison.

I want to read to you the platform of the American Trappers' Association—the organization I have the privilege to represent:

1. Protect and propagate beneficial wildlife.
2. Eliminate unnecessary cruelty in trapping.

3. Strenuous opposition to the use of poison baits to kill fur-bearers.

I wish to repeat, we do not wish any misunderstanding on the attitude of the American Trappers' Association on this matter. We stand solidly against the use of poison bait to kill fur-bearers.

4. Protect beneficial wildlife from unfair methods—smoking, den digging, tree cutting, and so forth.

5. Restock as much as possible all lands where desirable species are extinct; introduce new species where needed.

6. Demand laws in compliance with necessity—protective to wildlife and of benefit to the fur industry in general.

We ask for laws enacted by the legislatures of the many States that will seek to give the fur industry such protection that will enable it to retain its place as one of the leading industries of the United States, to insure a healthy business condition that will enable us to continue to give our share in taxes for the maintenance of the State and National Governments.

7. Protect trappers from dishonest fur houses and educate trappers to the proper methods of handling furs to enhance their value.

To the best of my own knowledge, the American Trappers' Association is the only trade association in the United States that is continuously exposing fraudulent fur dealers. We have been successful in many cases, but we do not possess the enforcing machinery necessary to enforce the laws of the States and of the National Government. We ask for stricter supervision of fur dealers who issue misleading price lists; by the many agencies that have the power to stop these unfair practices. We in American Trappers' Association are proud of the vital part we play in the bringing to market the thousands of pelts that go to make up stylish and warm clothing for men and women. We appreciate the fact that better methods of handling the raw fur means a better finished fur garment. We ask the cooperation of the Government in the education to the farmer-trapper that the Survey is doing for the silver fox and other ranchers of fur-bearing animals. We ask for a uniform bounty on predatory animals. We ask the federation to give this their careful consideration in their future deliberations.

8. Protect the American market from imported furs, the same as other industry; educate the American public to the superiority of American furs; insist upon all furs being sold under true name.

The American fur crop is about 50 percent of what it was some 20 years ago. The shortage is made up by the importation of cheap furs, which in most cases discredit the fine qualities of our own American furs. We ask the individual States and the National Government to disseminate such information through the schools of the Nation and through other channels as will tend to create pride of ownership of an American fur coat. We insist upon a definite plan or law that will enable the fur to retain its original name up through all of the processes of tanning, dyeing, and manufacturing until it reaches the consumer. We are not ashamed to have a mink reach the consumer as a mink, and we are in full accord with the better business bureaus and the Federal Trade Commission, which has taken a definite stand against the false and misleading names used to describe such furs as rabbit. Furs are a natural resource of this country, and I am of the opinion that the Government has the right to protect

its citizens from those who seek to undermine the good name of the fur industry.

9. Protect our forests from fires or other forms of destruction; encourage reforestation; protect our streams from undue pollution or commercialization; discourage drainage or reclamation of such lands as will be of more value as a refuge of fur and game.

This is plank no. 9 of our American Trappers' Association's platform. I am sure it will be the plank of the united and solid organization we are in the process of forming. Permit me to say that the C. C. C. camps could put their time to better advantage than digging and refilling holes. Let these boys fight the forces of erosion, filling ditches that are eroding into great canyons and let them replant the surface to trees and grasses. Not only will they be doing a great service to their country but they will go back to their positions in the agricultural, industrial, and business world with the knowledge that they have played a vital part in the building up of a new conception of a country's obligation to its citizens affording them an opportunity to enjoy the fruits of their labors.

10. Eternal vigilance and protection of the trapping and fur industry from any organization, or combination of organizations, whose purpose is based upon fanaticism or greed, or whose ideals are not in keeping with the rules of true sportsmanship, or, whose intentions are detrimental to the interests of the trapping and fur industry.

That is our platform. That is our creed. That is our pledge to our members and to every man, woman, and child in the United States. That is our pledge to our President, Franklin D. Roosevelt, who has inspired us to come here from all parts of our vast United States.

I am going to conclude by reading a letter from A. H. Crouse of Oklahoma. Crouse is a member of our Trappers' Association and here is what he says:

> I am sending you tear-sheet of marked paper of article about poisoning rabbits in this country, also many birds which they admit poisoning.
>
> And "they" tell you nothing is poisoned only that which poison is placed for—that has been the B. S. cry in the past.
>
> This is another very effective way of killing the rabbits—that is by staging rabbit drives. Farmers have made many drives here and claim it a success. Why not now? I am sending you this, thinking you may like to have the "dope."
>
> There is to be a conference in Washington February 3–7 of American wildlife. Can you send the marked paper to this conference? You probably know who is at the head of organization, etc. The coyote, skunk, owls, hawks, and all enemies of the rabbit have been poisoned, now the rabbits are taking the country. Next will be worms and insects of all sorts that will take the crops—the birds are all killed.

(Mr. Genfan read the newspaper clipping referred to above. It appeared in the Panhandle Herald of Guymon, Okla., and is from the Wednesday, Jan. 22, 1936, issue.)

Friends, I believe it is time to recognize the true value of our wild fur resources. I believe it is time to take stock of the luxurious comfort therein provided for American mothers, sisters, wives, and daughters. And last, but not least, I believe that in representing the foundation of an industry that annually involves, directly, indirectly, and incidentally several billions in transactions and commerce,

we are right in demanding the consideration to which our position would seem to entitle us. I take this opportunity to offer you the full cooperation of American Trappers' Association in a really constructive wildlife program.

Following the presentation of the above papers and resolutions there was a general discussion. The chairman presented a statement of policy as a basis for this discussion with due consideration for all that had gone before. The statement of policy as presented, amended, and finally adopted on motion made, seconded, and carried is as follows:

Whereas the fur animals in the United States have been immeasurably reduced by overtrapping, by destruction of forests by ax and fire, developing too much agricultural land, unwise reclamation of waste areas, pollution of streams, irrigation and drainage projects, and by wanton destruction caused by neglect and gross ignorance of the economic and social values of this important natural resource, and since we as a Nation are committed to the conservation of natural resources, which in its broadest sense means conservation with use, and fur animals are property of the people in the various States and should be managed to benefit all the people: be it

Resolved, That the fur resources management section of this conference be placed on record as advocating the following:

1. That the economic and social value of fur animals as a natural resource be more generally and specifically recognized by State and Federal Governments and that it should receive financial support for development from State and Federal Governments commensurate with its importance.

2. Inasmuch as basic statistical data essential to intelligent fur-resource management is and has been heretofore impossible of attainment, we recommend that the State and Federal Governments shall cooperate in a survey of the latent as well as visible supply of fur animals and we also suggest as the first step toward this end:

(1) The States shall inaugurate a reliable system of recording the annual catch of fur animals.

(2) All fur shipments in interstate trade shall be reported as to number and kind by the shipper to the Federal Government and checked by a similar report to the Federal Government by the receiver.

3. It is recommended to the States that their trapping laws be amended to segregate trapping from hunting and fishing by the issuance of trapping licenses to adult trappers at a reasonable fee and trapping permits to youths without charge, the object being to obtain statistical data on the annual catch of fur animals and to make it possible for the States to disseminate information to make trapping more profitable.

4. It is our conviction that the Federal Government has too long neglected and ignored the economic value of fur resources in the administration of public lands and we, therefore, urge that surveys be made by appropriate governmental agencies of areas in the public domain adaptable as or affording suitable habitats for fur animals, and, further, that such areas insofar as practicable be devoted to developing and maintaining this natural resource.

5. That in particular no reclamation, irrigation, or drainage projects shall be undertaken without the approval of the Biological Survey after this organization has determined the effect of such projects upon the natural supply of fur animals on the land under consideration.

6. Regardless of the laws in respect of the title to wildlife throughout the public domain it is our opinion that the physical act of trapping on the public domain is and should be within the judgment of the Federal Government as it is of private land owners, and that the control of trapping on the public domain is within the jurisdiction of the Federal Government.

7. While approving of the reduction of the use of poison by the Government in predatory-animal control, we believe that this reduction has not gone far enough and that other methods less questionable from the standpoint of conservation should be attempted. We further recommend that predatory-animal control be strictly limited to areas in which depredations are of severe consequence.

8. It is our belief that, generally speaking, open seasons for trapping fur animals are too long and that with due allowance for exceptions rendered

necessary by local conditions an open season of not more than 2 months in the prime-fur season of any year is sufficient and all that this wildlife resource can stand. We recommend that the States be encouraged to act on this recommendation.

9. We recommend a closed season of at least 5 years' duration throughout the entire country on fisher, wolverine, and marten. All of these are extremely valuable and are on the verge of extinction in the United States.

10. We deprecate the criminal and short-sighted activities of dealers in illicit furs, especially beaver, and suggest an aggressive policy on the part of the Government with which the raw-fur trade at large will cheerfully cooperate.

11. We heartily endorse the plan of the Extension Service presented at the North American Wildlife Conference which will assist in the development of fur-animal production on farms as well as the restoration and conservation of these animals in the wild as a means of increasing the income to agriculture.

12. We recommend that the Biological Survey as a Federal conservation agency be more actively engaged in research and experimentation relative to the restoration and conservation of fur animals and that the work of the section of fur resources be expanded for it is far too limited in proportion to the field it serves and to the total activity of the Bureau. Since the value of the annual catch of fur animals is approximately $65,000,000, the investment in fur farming $50,000,000, the yearly income to fur farmers $9,000,000, and the annual receipts of the United States Treasury about $10,000,000 from import duties and excise taxes on furs, including receipts from the sale of seal, blue fox, and predatory-animal pelts, we believe that an annual appropriation of $40,000 for the section of fur resources is wholly inadequate to properly handle the work. We therefore urge that the North American Wildlife Conference bring the matter forcefully to the attention of Congress.

13. We strongly urge that the project of conservation education in the public schools and in all other junior activities shall be carried forward and that it shall take precedence over all other forms of conservation activities.

14. We recommend that the present so-called luxury tax on furs be modified so that, first, the incidence of the tax will not so greatly depress the prices which farmer-trappers receive; and, second, so that the fur merchant will be free to offer his commodity without restraint from a stated value at which the present tax begins. We further recommend that study be given the Canadian fur-tax system as an indication of the plan to pursue in modifying the present tax.

15. We agree in principle with the projects to establish a federation of conservation interests and offer our cooperation to that end.

On motion made, seconded, and unanimously carried, it was resolved that a committee of three be named to work out the details of presenting this paper to the federation and other appropriate agencies. The committee named comprised: David C. Mills, chairman, editorial director, Fur Reporter; Chester H. Gray, American Farm Bureau Federation; Frank G. Ashbrook, in charge, fur resources, Bureau of Biological Survey.

The meeting then adjourned.

David C. Mills,
Acting Chairman.
Elsie Galloway,
Secretary.

THE PROBLEM OF VANISHING SPECIES

FRIDAY MORNING, FEBRUARY 7, 1936

Chairman: DR. T. S. PALMER, Washington, D. C.
Committee: JOSEPH S. DIXON, National Parks Service; DR. A. A. ALLEN, Professor of Ornithology, Cornell University, Ithaca, N. Y.; WM. L. FINLEY, Portland, Oreg.

This session was called to order by the chairman, Dr. T. S. Palmer. In his opening remarks, Dr. Palmer mentioned that there was an exhibit of our vanished species at the National Museum.

THE PROBLEM OF VANISHING SPECIES—THE TRUMPETER SWAN

(By BEN H. THOMPSON, National Park Service, Washington, D. C.)

I hope that the trumpeter swan will not become one of the vanishing species.

What I have to tell you this morning is not a story of scientific research but is, rather, a brief résumé of the activities to preserve this bird from extinction. I do not know how much to tell, since I believe all of you are familiar with the main facts of the swan conservation program of the last few years. For the benefit of some who may not be familiar with those facts, however, I shall review them briefly.

In 1929, because of the rarity of the trumpeter swan in Yellowstone National Park, it was decided to conduct a survey to determine its status and what conditions were affecting it. The job was a slow one and difficult to perform. In the first place we did not know where the swans nested and there was a large territory to reconnoiter. One could always get an endless variety of promising stories which, when run down, were found to lead nowhere. After several years of such reconnaissance, we felt that we had located most of the trumpeter swans still existent in the Yellowstone region. It soon became apparent that protection of the bird could not be accomplished within the park alone, for approximately half of the remaining birds nested at Red Rock Lakes, about 35 miles west of Yellowstone National Park, in Montana. The two Red Rock Lakes are marshy depressions in the Centennial Valley. It is an ideal breeding ground for the birds because they must have shallow water for feeding, adequate protection afforded by lush, marsh growth—typically, tules in this area—and islands or suitable localities for floating nests. These conditions exist at Red Rock Lakes.

The lakes have been used as a duck-hunting ground for perhaps 40 years. Six or seven duck clubs are located along the lake shore. Each year from one to several swans were killed during the hunting season. This was just sufficient toll to keep the very small population from increasing. Unless measures could be enacted to prevent

this annual slaughter, there was no possibility of preserving the species. An additional element of danger lay in the fact that extensive areas of the marsh land were heavily impregnated with lead. In the summer of 1934, when the lakes were unusually low, these lead-infected areas were exposed, which resulted in a considerable loss of ducks by lead poisoning. Swans are also susceptible to lead poisoning but to our knowledge none died from this cause that year. Perhaps this fortunate result was obtained because the swans prefer to feed in slightly deeper water and because their feeding habits are such that they are not so apt to pick up the lead.

The censuses conducted over several years led us to believe that there were probably from 75 to 100 trumpeter swans still existing in the United States, all of which were within the Yellowstone region. A few pairs still nested at secluded lakes in the vicinity of Jackson Hole, but in one of these lakes fish were planted; fishermen developed a new road and disturbed the nesting pair, so that they failed to hatch any cygnets. That same fall one of the pair was shot. The lake has not been used as a swan nesting ground since. This episode is characteristic of events as we found them throughout the swan region.

In 1934 Mr. J. N. Darling, Chief of the Bureau of Biological Survey, made a personal investigation of Red Rock Lakes and recommended it as a wild-fowl refuge. The Biological Survey, in cooperation with the National Park Service, has secured options for approximately 25,000 acres to establish the sanctuary. Last fall a Survey warden was placed in charge of the refuge and succeeded in bringing the swans through the hunting season without loss. While duck hunting is still permitted within a single restricted area in the lower of the two lakes, that arrangement appears to be satisfactory. According to reports from the area during the last hunting season, when the shooting begins the swans leave the hunting area and inhabit the upper parts of the lakes. I might say that this hunting arrangement appears to me to be entirely justifiable and was necessary in order to secure the refuge at all. The warden there has done excellent work in developing the local awareness of what we are trying to do and in gaining the cooperation of the local people. It is contemplated by the Survey to stabilize the water levels of the lakes so that the lead-infected areas will be covered with sufficient water at all times. Trumpeter swans do not migrate from this region. The problem is therefore localized.

It was impossible this last summer to take a complete census either in or outside Yellowstone National Park. The records kept indicate that there was a larger cygnet crop this year than at any other time since the problem has been studied. Approximately 46 adult birds were counted this season and 27 cygnets. It should be emphasized that this was not a complete census. There is no reason to believe that there are any fewer trumpeter swans this year than in the past 5 years. To the contrary, it is probable that there has been a slow but definite increase.

I talked with Mr. Hoyes Lloyd about trumpeter swans in British Columbia, and, while it is not the policy of the Canadian Government to give information regarding the location of these swans, he did report that he was satisfied with the protection that they are receiving and that their numbers were apparently constant. It is hoped that

a complete census of all the swan areas can be taken this summer. It is believed that we can reasonably expect a definite increase from the measures which have been enacted.

DISCUSSION

In remarking about the above paper, the chairman of the session said that the story of the trumpeter swan is one of the most tragic of all birds of North America. It has the misfortune to breed a little too far south, and its winter range has been encroached upon. In the prairie provinces the bird has been shot on account of its size.

The question was asked: Do the swans live in Yellowstone Park in the wintertime? Mr. Thompson said they flocked back and forth from the Teton country to the Red Rock Lakes. A question regarding mortality before flying age was asked. Mr. Thompson said that a complete census was not kept. You might say the mortality might be as high as 50 percent, but it varies considerably. There have been several summers when one nest has been watched—it would have from four to six each summer. In other summers it might be destroyed by some enemy.

Mr. Borrell asked how far south did they originally nest? Dr. Palmer said he couldn't say exactly—northern Kansas or southern Nebraska.

The question was asked: What are the enemies of the trumpeter swan? Mr. Thompson said man is the real enemy. There is some possibility that coyotes may have taken some toll of the young in some places; however, there has been no definite evidence of this. There is a bare possibility that the great horned owl and otters may be their enemies but we are sure that eagles are not.

The following incident was related when the enemies of the trumpeter swan were being discussed:

One of the gentlemen present said he had spent a period of several days at a critical time at a particular breeding ground where there was a young brood. He said he knew where the danger point was. He said he watched one night and the complete brood was there as late as 8 o'clock and after. He said he heard no commotion—no outcry, and he was within 100 yards of where they were roosting, but at break of day they had gone. He said he searched for evidence and the only clue he could find was that on the bough of a tree where a horned owl had been perching he had found a little of the down from a trumpeter swan—some are pure white and some are gray. He said the pure white ones are more likely to disappear. Someone asked him if there were any rattlers or snakes there and he said none that could be accounted for destroying the swan.

The Status of the Sierra Bighorn Sheep

(By Mr. Joseph S. Dixon, National Parks Service, Berkeley, Calif.)

Originally in California we had at least three outstanding big-game mammals: The grizzly bear, the Sierra bighorn sheep, and the tule elk. Our great grizzly bear has gone, having disappeared within the lifetime of one generation. The Sierra bighorn sheep, which is closely related to the Rocky Mountain bighorn, is now in a

very precarious condition. We now have a State game refuge for the tule elk.

There have been a number of changes which have resulted in the status of our Sierra bighorn. On the Sierra Nevada it winters entirely on the eastern slope down around 5,000 or 6,000 feet. I have been interested in trying to trace the causes of reduction. If you go over the vanished species in the great majority of cases you will find, I think, that man is the basic cause of their disappearance. The human element is the one that has here caused the decrease. This has been brought about in various ways, as by human beings, through deer hunting, even though Sierra bighorn are totally protected by State law; and by grazing of domestic sheep on the winter range—they eat up the food which should be preserved for the wild sheep. We also have intensive human occupation in the form of summer camps. Dr. Grinnell's plan was to encourage them into gradually drifting back to their former habitat in Yosemite National Park. They don't take kindly to human occupation, and you can't blame them for not taking human beings into their confidence. Predators—there has not been any decided increase in the predators in the Sierra bighorn habitat. I spent a lot of time combing that area this fall. Coyotes were not found in any abnormal abundance.

In running down records of the Sierra bighorn it is easy to get various reports, but nearly always they are old reports and it is very difficult to get up-to-date information. My information is as of September 1935. The only flock of Sierra bighorn we can put our fingers on is one near Mount Baxter, a little north of Independence. This flock has been seen the past summer by three different parties and four individuals, so that we have a close check on their status. On the 22d of last July two members of the Sierra Club while climbing Mount Baxter report that they saw six Sierra bighorns—two rams, two ewes, and two lambs. Norman Clyde spent the entire summer in the region and until about the 7th of September, and he said he hadn't succeeded in laying eyes on a single Sierra bighorn until he found the same Mount Baxter flock. He examined them more closely and he reported the flock as consisting of two rams, two ewes, and one yearling and one lamb. On September 6 I saw one additional member, a 3-year-old ram, chased out by the older ram until he could grow strong enough to fight his way in. I think we have seven in that one flock. The difficulty is in preserving it. These sheep are in a rugged part of the country. We had to start at daylight, going up 7,000 feet, and it took us about 9 hours climbing up and about 3 hours coming back, often after dark.

We found that the critical factor in the decline of the Sierra bighorn is the hunting by deer hunters on the west slope of the Sierra Nevada on a national forest. If the Kings River Canyon National Park should go through, we might possibly save these native mountain sheep. In the late summer they go over the western slope. I found on investigation from testimony given by the hunters themselves and of everyone living in that region that some bighorn are shot each year, chiefly yearlings. These bighorns were shot and used for camp meat and not for trophies. There was one case where a hunter shot a tule elk and he thought he had shot a big buck deer. It is through ignorance that some shooters shoot these valuable ani-

mals. Then we have the other type of hunter who glories in shooting something because it is forbidden. Our official presence there caused a great deal of worry among such hunters, and the fact that somebody was looking after the sheep had a wholesome effect. I interviewed my friends in the California Division of Fish and Game. We plan to bring in a roving ranger. The critical time is only a matter of a month. The coming of the snow usually closes the deer season. I think if we can have a roving ranger we will be able to do a lot toward helping those sheep. They have reached about the same stage as the trumpeter swan—they are down to the danger point. There are two possible other small bands—tracks of two were seen back of Convict Lake this spring on the Old John Muir Trail. Up on Mount Langley, an altitude of 13,000 feet, on October 7, 1935, I found tracks of two Sierra bighorns that had been made within the past 6 or 8 months, and it has been reported that there was a band of seven seen in that region 3 years ago. It has been heavily hunted, but no one has seen them since. We don't know if they are still there.

At present the Sierra bighorn is in a dangerous condition but if taken promptly in hand and if adequate protection is given them we may be able to save them. We are getting help from the Forest Service. They are withdrawing all sheep that may compete with the bighorns in their known range. In Colorado some of the Rocky Mountain bighorns have been contaminated by disease of the domestic sheep. The big difficulty is, as has happened with other species, the danger point may be reached any time even before we realize it has happened. This is the most rugged portion of the entire Sierra Nevada region and if we can control the human element.I think it will be possible to bring the Sierra bighorn back.

DISCUSSION

Colonel White remarked: "I have never seen a mountain sheep. Perhaps what could be done would be to disseminate information among hunters—furnish every hunter with a little folder—making a personal appeal to each of them not to shoot this species. Tell them how near they are to vanishing." Colonel White also suggested that it may be necessary to restore native grasses for the sheep.

Dr. May asked the present status of the King's River project and if it could be pushed along by this organization. Mr. Dixon said that since Colonel White had jurisdiction over the project, he would know more of its present status. Colonel White said that sentiment in the locality was opposed to the project—possibly its strongest opponents are the sportsmen. A few years ago the irrigationists were opposed to it but that has diminished some; those who take packing parties through the Sierras have set up opposition as have the cattle and sheepmen—they are all tremendously opposed to the completion of the King's River National Park. Those favoring it are the conservation organizations and women's clubs, but the opposition is so much greater, and until that is withdrawn there is no chance to get it going.

The chairman of the session remarked that there is now pending in Congress a bill introduced by request by the senior Senator from California. (The bill had reference to the above-mentioned project.) There is no bill in the House and the Representative from that dis-

trict cannot introduce a bill on account of local sentiment. There is almost no chance to get the bill introduced.

Mr. Crone Miller, California Forest Service, said they were interested in the Sierra bighorn and wanted to offer their cooperation if there was anything that could be done for its preservation. Mr. Miller said if the problem was that of man "We can perform an excellent function in the education of hunters; if it is a problem of refuges, we shall establish refuges; if it is a problem of eliminating domestic sheep, we can eliminate those. We offer our cooperation."

Mr. Madsen made an announcement of a hearing on February 10 between the National Association of Woolgrowers and Cattlegrowers and the Public Lands Service to protest against domestic sheep on the range. He suggested that the wildlife organization be represented at that hearing, if possible.

Sand-hill Cranes in Wisconsin and Other Lake States

(By Franklin S. Henika, Madison, Wis.)

The sand-hill crane (*Grus canadensis*) in the Lake States is now limited to a few large areas of deserted marshland where the intensive cultivation of modern agriculture has not penetrated. The accompanying map shows the distribution of these marshes. I am indebted to Mr. Owen J. Gromme and the Milwaukee Public Museum for information and for the lantern slides which will be shown.

The largest general nesting area remaining is in central Wisconsin, where several groups of nesting cranes occur, one in the Cranmoor region of Wood County and the Bear Bluff marshes of Jackson County, and another some 30 miles away in the Roche a Cris marshes of Adams County. Additional locations where nesting sand-hill cranes have been reported are farther east in Marquette and Green Lake Counties. These central Wisconsin counties probably have a population of 20 pairs of sand-hill cranes.

One or more pairs of sand-hill cranes have been known to nest in recent years on the Peshtigo Brook marshes of Occonto County and on the St. Croix River marshes bordering Wisconsin and Minnesota. There have also been unconfirmed reports of nesting sand-hill cranes near New London, Wis. The total sand-hill crane population of Wisconsin is therefore estimated at about 25 breeding pairs.

In Minnesota authenticated reports place one or more nesting pairs of sand-hill cranes in Pennington and Norman Counties, in the northwestern part of the State.

The Seney marshes of Schoolcroft County, Mich., have a fine colony of nesting sand-hill cranes consisting of perhaps 10 pairs of birds.

Cranes have been reported also in Chippewa County near Whitefish Point, and it is highly probable that they nest there.

In the Lower Peninsula of Michigan breeding sand-hill cranes have been reported in the area of the Portage Lakes in Jackson County, in the Chandler marshes in Clinton County, and in the Convis area, Calhoun County.

At present the sand-hill crane in the Lake States inhabits areas which combine the following general characteristics:

1. Large expanses of grasslands, usually wet marshy hay meadows, or burned-over aspen stands which have grown up to grass.
2. Small but frequent pools or ponds of shallow water or streams.
3. Sandy and peat soils.
4. Range extensive enough to provide refuge from poaching.

This latter requirement has forced the sand-hill crane into the most remote and unsettled portions of the Lake States, where the other requirements are met. Usually the surrounding territory is well forested with aspen, birch, and oak.

There is apparently less direct conflict than might be expected between the use of an area by cranes and by man simultaneously, provided the nesting environment is preserved and poaching eliminated. Sand-hill cranes frequently use pastures, unsodded roads, plowed fields, and old burns, spending many hours at a time in such places. They have been observed to nest on cranberry reservoirs in close proximity to the scene of cultural operations on cranberry beds without evincing undue concern.

Three of the Lake States sand-hill crane nesting areas have recently come under partial administrative control of Federal Government agencies (central Wisconsin, Resettlement Administration; Seney marshes, Biological Survey; St. Croix River, Resettlement Administration and Department of the Interior).

It must be emphatically pointed out that acquisition of sand-hill crane nesting grounds does not solve the problem of perpetuating this magnificent species. With the effective exclusion of fire and the removal of settlers in central Wisconsin, for example, much of the country will revert to forest, changing and very possibly destroying the sand-hill crane environment. Large blocks of range must be kept open for them. Controlled fire and partial cultivation are desirable because insofar as is known, this is in part acquired range, with a climax ecological type consisting of tamarack, spruce, and other swamp trees. Management is essential, therefore, if the sand-hill-crane environment of central Wisconsin and of the Lake States in general is to remain habitable.

Similarly, administrative control by a public agency introduces immediate complications from the standpoint of public use. Wise policies in regard to roads, firelanes, hunting, and coordinate land uses must be developed and adhered to unswervingly. If the species is to survive in satisfactory numbers, we must learn more of the factors on which the welfare of sand-hill cranes is dependent. What we now know of these birds and their requirements barely suffices to outline a few preliminary steps in range management. Sand-hill cranes in the Lake States are so rare that no effort should be spared to insure their preservation and increase.

DISCUSSION

Mr. Aldo Leopold, in trying to establish a date for their first appearance in the Lake States, related the following incident: "I was working in that region and questioned the farmers as to how many years they had been there and how continuously they had occupied the present breeding grounds. I met one fellow who said they had been there since 1848. Since he seemed so emphatic about

it, I asked him how it was he knew so well." Mr. Leopold said the farmer looked to be about 45 years of age. The farmer said his mother had married in 1848 and settled on the farm he now occupied. At the time she arrived there she ran into some sand-hill cranes * * * the old crane stabbed a hole in her arm and she carried a scar for the rest of her life, and the farmer said that he had heard that story every year for 40 years.

Mr. Pearson said he saw a peculiar action of sand-hill cranes in Texas. He was with Richard Kleberg, and he said flocks of cranes were coming over the prairie and they ranged in number from 16 to 20 birds. Mr. Kleberg said he was going to drive one of these flocks. They were flying about 75 feet. He was right where the birds would have to pass over. He regulated the speed of the car and he drove them for 4½ miles directly eastward when they wanted to go southward.

Professor Swenk said there were cranes in Texas and Nebraska. He said there were tens of thousands of the little brown cranes going through that area. We are dealing with a form that is disappearing; they are the small northern bird. The sand-hill crane has disappeared as a breeder; they disappeared from that region in the 1880's. "I might report, as supplementary to the report given by Mr. Henicka, that about 4 years ago a flock of whooping cranes, consisting of 70 birds, flew over this region, and this flock is still in existence."

Mr. B. W. Cartright, of Manitoba, said there were large numbers of crane in his territory. The fall flights this past few years have decreased very greatly, due, no doubt, to the drought in Saskatchewan, and they have taken a well-watered route. The specimens coming to my attention have been the little brown cranes. "I received a report last year from a man who resided in this territory for 40 years, and he said the flight of cranes had never been greater than this past year, 10,000 passing over his district."

The chairman commented somewhat on the history of the cranes in the United States. He said we had four cranes—one western, one southern, one in the Northwest, the sand-hill crane. Their range has been cut in two and there are only certain places where you will find them breeding.

Status and Distribution of the Grizzly Bear (Ursus Horribilis) in the United States

(By George F. Baggley, National Park Service)

When Coronado marched from the city of Mexico through Arizona to the Seven Cities of Cibola and on to the Buffalo Plains of Texas and Kansas in the year 1540 his party certainly saw the grizzly, the king of carnivores, although his party failed to make a definite record of the species at that time. The first authentic record of the presence of grizzly bear in the United States was probably by Edward Umfreville, who spent the winter of 1774 in the service of the Hudson Bay Co. in the northern Rocky Mountain section. Authorities, however, are not inclined to give Umfreville the first credit but consider Hearne as the first actual discoverer and recorder of

grizzly bear in North America. His record, although not published until 1795, was made in July 1771, and his observations were recorded in his famous Journey to the Northern Ocean during the years 1769 to 1772.

Lewis and Clark on their exploration of the Louisiana Purchase in 1805 and 1806 report in their diary of having observed the grizzly bear ("the white bear", "the gray bear", "grizzly bear") along their route of travel to the West coast and return. Indian scouts, Army detachments, and pioneer trappers throughout the West have reported the presence and activity of the grizzly bear from the first days of western exploration. Among the most authentic reports are those of George Ord, Alexander Henary, Dr. Elliott Conres, and in later years John Muir, W. H. Wright, as well as many others who frequented the West during the latter part of the nineteenth century.

It was not until 1815 that the grizzly bear in the United States was actually described and given a scientific name. At that time Ord described the species and gave the name now in use. For the purpose of this discussion the term "grizzly bear" is meant to include both the type species and any subspecies which may exist in the United States at this time. The scientific name was based largely on the coloration of the bear and his general formidable appearance. The terms "silver-tip", "great back", "white bear", "gray bear", "bald face", and "big bear of the mountain" were commonly applied by pioneers who visited the West during the 1800's and the early part of the present century.

Little is known or recorded regarding the probable number of this species of bear in the early days of the exploitation of the West, and it was not until 1915 that any definite recorded estimates of probable numbers were made. However, a few scattered records going back more than 100 years indicate that the grizzly bear was relatively abundant throughout its hereditary range. An early record from California in 1799 by Hittell, the historian, indicates that they were very plentiful over the country and did great damage to the cattle and gardens of the first settlers. One historian records that in one county in California 30 or 40 grizzly bears were seen in one day and not considered as an uncommon sight. Newberry, writing in 1857, said that the grizzlies were unpleasantly abundant in many parts of the Coast Range and Sierra Nevadas in California, where large numbers were annually killed by the hunters and where a few hunters were annually killed by the bears. Dr. John C. Merrill says that in 1877 bears were plentiful in the Big Horn Mountains of Wyoming and Montana, and that in 1 day he has seen as many as nine "silver-tip" in the mountains. W. H. Wright records in 1883 that in the vicinity of Spokane, Wash., he and his companions saw 11 grizzly bear in 1 day in spite of the fact that they were new to the work and were awkward in traveling through the cover, consequently frightening away a great many animals which they did not see. These and other scattered reports are practically all of the records available as to the early numbers of grizzly bear in the United States. When the organized settlement of the West began regular functions of government were extended more systematically and regular information was recorded. We are, however, concerned only with the

past history of the grizzly bear as it relates to the present distribution and number of this species.

In 1915 a few records were kept by the United States Forest Service and the United States Biological Survey. They were all, however, recorded simply as bear, with no distinction between the grizzly and black so far as abundance was concerned. In 1921, however, records were broken down and kept for grizzly and black bear separately.

The difficulties involved in securing anything like an accurate census of grizzly bear must be realized and taken into account in the analysis of any data regarding their number or distribution, for of all wildlife species, the grizzly bear undoubtedly is one of the most difficult to enumerate, and I should like you to consider the figures and data given in this paper as being the best available estimates of the field officers of the National Park Service and other Federal agencies which have kindly supplied what information they had available.

For comparative purposes I have taken 1924 as representing the best available estimate of grizzly bear which can be compared with recent counts and estimates made in 1934–35. These records show that in 1924 in two national parks—Yellowstone and Glacier—in which grizzly bear occurred, there was estimated to be a total of 135. In the 7 States within the hereditary range of the grizzly bear in which they were known to exist in 1924, Montana and Idaho had the largest number, with Montana reporting 458 and Idaho 116. The total grizzly bear estimated to be in these 7 States at that time was 724; that, together with the estimated total in the 2 national parks, gives a grand total of 859. Of the estimates for the various States, it is interesting to note that the State of Washington estimated 22, Wyoming 62, Utah 12, Colorado 27, and Arizona 27. Comparing the 1924 records with those of 1934–35 we find that in the national parks there are now estimated to be 342 grizzly bear, an increase in the national park number of 207. During this time Grand Teton was added to the national park system, and 10 grizzlies were estimated to be in that area. In the same seven States reported in the 1924 record, Wyoming is the only State showing an increase of grizzly bear. There it was estimated that they had increased by 77. All of the other States show a decrease, making a total for these 7 States of 671, or a loss in the total outside the national parks—compared with 1924—of 53. The increase in the national parks of 207 bear over the 1924 figure, together with the 671, or a loss in the total outside of the national parks, compared with 1924, of 53. The increase in the national parks of 207 bear over the 1924 figure, together with the 671 reported to be present within the limits of the hereditary range of the species. This figure is an increase of 154 over the 1924 data. Losses, however, in numbers occur in Washington, Utah, Colorado, Arizona, and New Mexico, and in these States the presence of grizzly bear today is considered extremely doubtful by officials of the United States Biological Survey and other interested scientists. The tendency, as indicated by these figures, estimates though they are, is a dangerous one for the future of the species. In five States where there were small nuclei

in 1924, their presence is doubtful years later, indicating what always happens when a species gets so low in numerical strength.

Number of grizzly bears in national parks, 1924:		
Glacier	60	
Yellowstone	75	
		135
Number of grizzly bears in national forests, 1924:		
Washington	22	
Idaho	116	
Montana	458	
Wyoming	62	
Utah	12	
Colorado	27	
Arizona	27	
		724
Grand total		859

	Number of grizzly bears, 1934	Increase (+) and decrease (−) over 1924
Number of grizzly bears in national parks, 1934:		
Glacier	112	+52
Yellowstone	220	+145
Teton	10	+10
Total	342	207
Number of grizzly bears in national forests, 1934:		
Washington [1]	6	−16
Idaho	55	−61
Montana	455	−3
Wyoming	139	+77
Utah [1]	4	−8
Colorado [1]	3	−24
Arizona [1]	7	−20
New Mexico [1]	3	
Total	671	53
Grand total 1934	1,013	

[1] Figures for these States considered extremely doubtful.

The mountain section of Idaho, Montana, and Wyoming can be considered the critical range for the grizzly bear and the area in which they must be protected if the species is to be preserved. Of the three national parks lying in this general region—Glacier, Yellowstone, and Grand Teton—the two former only are large enough units in themselves to offer a considerable measure of permanent protection for the species. They are, however, relatively small compared to the requirements of a natural habitat in which any number of the grizzly bear could be preserved. Yellowstone, with its estimated population of 220 grizzly and Glacier with 112 are probably approaching their maximum carrying capacity, or practically so, as far as a grizzly-bear population is concerned. Teton National Park, situated as it is in the midst of a domestic stock range and being very narrow in width, offers little permanent protection because of its limited area for species which has as wide a natural cruising range habit as do the grizzlies. It, therefore, seems paramount that if the grizzly bears are to be preserved they must have additional territory aside from the security of the three national parks in which they now occur. The most suitable territory is undoubtedly that section of the

Rocky Mountains in Wyoming and along the border between Idaho and Montana and north to the Canadian border. In this region there still exist many large wilderness tracts within the national forests, and if these bears were given a reasonable measure of protection their perpetuation would be assured.

When the precarious condition of the buffalo was recognized about 1900 and steps taken which culminated in an act of Congress in 1902 providing for an appropriation to preserve a small herd in the Yellowstone National Park, their numbers were undoubtedly in excess of the present estimated number of grizzly bear in the United States. Does it not, therefore, seem advisable that appropriate action should be taken in regard to affording some permanent protection for the few grizzly bears now known to remain in our northern Rocky Mountain section of the United States?

That their precarious status has not been recognized until recently within the limits of their hereditary range is indicated by the fact that until 2 years ago the grizzly bear was considered a predatory animal and was pursued and killed almost at will without even a license in some cases.

Who is responsible for the present status of the grizzly? Well, the pioneer, hunters, traders, trappers, and later the settlers, stockmen, and sportsmen may all accept some measure of responsibility, yet to blame them will avail nothing.

Although omnivorous in habit, the grizzly undoubtedly began his retreat to a restricted range simultaneously with the shrinkage of the numbers and range of the large herbivorous mammals which occurred during the early days of western development and settlement. Unlike the bison, elk, and other plains-grazing species, the grizzly, fewer in relative numbers and less compatible with civilization, continued his retirement further and more rapidly into the wilderness where the few remain today.

In considering the problem of perpetuation of the silvertip we may remember what nearly happened to the bison, the trumpeter swan, the tule elk, and what has actually happened to the whopping crane, the heath hen, and the passenger pigeon and other exterminated wildlife species. The numbers are now at the danger point and action is necessary.

The future status of the grizzly seems to depend on two principles, one a recognition of the bear as a fine American animal, as worthy of protection as other species, and secondly, providing protection for it within the critical range.

In the three national parks, Grand Teton, Yellowstone, and Glacier, which are within the hereditary range, they will always have full protection for about their present numbers. Outside of the parks, however, additional protection is needed as soon as it can be given and it is the only measure that will preserve the old silvertip.

DISCUSSION

Dr. Palmer, the chairman, in commenting upon Mr. Bagley's paper said he had given us a summary dating back a century and a half ago. He said this specie never had a scientific name until 1815. He said one report showed that the last grizzly had been shot in

Sequoia; however, there are 220 in Yellowstone Park and 112 in Glacier Park.

Mr. Aldo Leopold remarked somewhat as follows: The question is, What is the Biological Survey and Forest Service going to do about the grizzly? National parks cannot bear the responsibility, and it is evident that the danger lies in reducing the total number of them. Keep as large a number of remnants as possible. After having been a member of the Biological Survey, I can visualize the mental process by which this extermination is being allowed to go on, but this new federation will now have an opportunity to outline an aggressive program. We have gone so far on the premise that when there is a conflict between the bear and the livestock, the livestock should move. It is not the bulk of the livestock industry that interferes with the bear; it is here and there a flock that interferes. It seems the Federal bureaus should select a remnant in each forest region and establish a range in that region. The most favorable spot is the Mogallon Mountains in New Mexico. It is time now for an interbureau plan of action. Leave out the ranges that conflict with that remnant, bring in the administration of the wilderness area, bring it into harmony with the needs of the grizzly. It is one of the many rare-species problems that pertain to the conservation bureaus. I would suggest that the bureaus create an interbureau committee which will be able to handle the problems that need to be solved and do what is necessary to be done in each locality in order to save the remnants. If that job were done by the interbureau committee it would be done in a satisfactory manner, whereas if it were done by scientists outside of the bureaus, it would not be done so well. A suitable portion of the conservation funds should be directly focused on the grizzly bear and other rare species.

At this point someone remarked that the States must be taken into consideration, as there is no Federal land in some of the States.

Mr. Shelford of the University of Illinois said that resolutions were passed in St. Louis and have been forwarded to the Park Service, to the Department of the Interior, the Biological Survey, and the Forest Service, asking that a zone of protection for all of our wonderful animals be set up 25 miles around Yellowstone and 25 miles around Yosemite to carry out such a plan as Mr. Leopold suggested.

Dr. Merriam remarked that a great deal is being done for the farmer, and the place for the sheep is on the farms and not in the national parks.

Dr. Walter B. Taylor, of College Station, Tex., gave a talk on the Pronghorn Antelope in the Southwest [no comments].

After this talk Mr. Albert G. Nye, of the American Peregrine Association, brought in a live duck hawk, which species he said may become extinct, and he was interested in the preservation of the bird. He said they took them and trained them in falconry and through that they would know which birds to control and which not to kill. It is getting very rare. I think it is a matter of years now and they will be on the list nearing extinction. Their eggs are being taken all the time. When we take them from the nest for falconry, we leave in the nest one-half of the birds for propagating.

Dr. Palmer asked Mr. Nye how long had he had this bird in training.

Mr. Nye replied that it was about 8 months old and was captured in upper New York State. It is in immature plumage. He said its head will turn almost coal black and most of the brown will leave it. The back will turn blue with very shiny color and the breast will become white with a few bands across it; this will happen at the first molting and in the second molting she will have all of her colors.

Dr. Alice Brown, biologist and embryologist, asked what the eggs were collected for.

Mr. Nye replied that it was a sort of mania for personal reasons. They also collect them in trade for eggs of other continents. Dr. Brown said her interest in the eggs was her studies in embryology and she said there would be some legitimate reason for collecting them for that purpose. Mr. Nye said their eggs were very important for egg collectors and they were also collected for their beauty.

THE PRONG-HORNED ANTELOPE IN THE SOUTHWEST

(By Dr. Walter P. Taylor, U. S. Bureau of Biological Survey)

Let me recall to the minds of those of you familiar with the West a vast expanse of open rolling plains and mesa country, often with blue ranges of mountains on the horizon, vaulted skies, clear atmosphere, vivid morning and evening colors, and through the day an abundance of sunshine.

This is the country of the prong-horned antelope, one of the most graceful and interesting of our big-game animals. In its horn characteristics, at least, something of a cross between the bovid and the deer, the pronghorn is unique. While the bear, elk, deer, moose, and bighorn, we share with the Old World, the antelope is peculiarly our own, for as is well known, the pronghorn and its ancestors are solely North American. Furthermore, it is the only living species of its genus, and its genus is the only one in its family. It is one of the oldest families of American mammals. If it becomes extinct, there will be no similar creature left on earth.

Particularly since Dr. E. W. Nelson's review of its numbers and distribution in 1925, the species has attracted a good deal of attention. Fortunately, measures taken for its conservation, including State-wide protection, and in some instances special preserves, have brought about an encouraging increase in its numbers in several places. So marked has been this increase that open seasons on antelope recently have been allowed in at least two Western States.

The events of the last few years have afforded clear demonstration not only of the entire practicability of saving the antelope in certain localities in the West and Southwest but also of making it abundant enough to permit a carefully regulated open season, if desired. It has been shown also that the restocking of many of its former ranges is as possible as it is highly desirable.

There is little question that antelope numbers can be substantially increased in many localities in the West. At present the distribution of the animal is rather spotty. In some instances in southern Arizona, New Mexico, and western Texas the antelope has been com-

pletely crowded off its original range. In other cases it is most encouraging that the numbers of antelope are increasing, but some of the animals are short of winter range. I have in mind one series of herds on a high mesa in Arizona. Some 2,300 antelope were counted in this area by a group of Forest Service men and their cooperators in February 1935. In extremely bad weather, when deep snow falls on the high mesa where they spend most of the time, these antelope are accustomed to drop down to lower country where there is little or no snow. Unfortunately, the lower country is controlled by livestock interests, which graze domestic sheep on the winter range of the antelope, and the land is being rapidly denuded of forage through overheavy use by these animals. If present conditions continue, seemingly the forage will be depleted in a few years, the soil eroded, and the livestock company itself automatically eliminated from the picture. The antelope on this mesa, undoubtedly the most notable series of herds still remaining in Arizona, may suffer most severely of all.

There is another instance of the dependence of an important higgame species upon winter range. Apparently necessary to give security to the antelope in this instance are State or Federal intervention and acquisition of adequate winter range for these antelope on a condemnation basis, if necessary.

A few days ago I saw some 90 antelope in the pasture of a certain wildlife-minded cow outfit in western Texas. This outfit has 200 or more antelope on a relatively small range, perhaps 2 or 3 sections in extent. The antelope are in excellent condition, and the herd is an outstanding asset in that part of the country. It is more than that—for it constitutes a living demonstration of the practicability of maintaining antelope and cattle on the same range, and both in excellent condition. What this outfit has done can be carried out, if desired, probably on millions of acres of cattle ranches in western Texas. The antelope do not do well on sheep ranges, but they seem to thrive on the cattle ranches. If desired, it is believed that the numbers of antelope in western Texas can be increased a hundredfold. It is worth noting that in many places alert and conservation-minded stockmen are responsible for saving the antelope and other wildlife on their ranges, often at some cost to themselves. We may sometimes criticize the stockmen, but we should remember to give credit where credit is due.

Down along the southern boundary of Arizona, in what is one of the most arid sections of the United States, lies a desert country of rare beauty. It is a land that puts one in mind of the Palm Springs country near Los Angeles, although it lacks the movie stars. While it is inaccessible except to hunters and prospectors, and lacks human inhabitants, except for a few Sand Papagoes (a race of Indians so well adapted to the desert that they are reported by Prof. Kirk Bryan, now of Harvard University, to have been able to run down jack rabbits on the drifting sand so common in the region), it is a country of enormous interest for its wildlife, present and potential. In the bleached desert ranges of this area, seemingly innocent of vegetation, and resembling nothing so much as the papier mâché mountains one sometimes sees at the theater, dwells the Gaillard bighorn, a species of mountain sheep peculiar to this part of the United States and adjoining portions of Mexico. In some of the broad desert valleys, partly in

the United States, partly in Mexico, there still persist also a remnant of the antelope that formerly were relatively much more common through the region.

It is hoped that the authorities of the United States and of Mexico can reach an agreement to set aside a considerable area of country along the border as a wildlife refuge. There is but one small cow outfit in the entire region, at least on the American side. A few prospectors work the territory. Aside from a handful of Indians and an occasional smuggler or United States customs agent, there are no other inhabitants of the area, and no permanent residents at all. Both antelope and bighorns are at present subject to poaching on both sides of the international boundary line through lack of adequate warden service.

The Cabeza Prieta Wildlife Refuge, embracing the American portion of this area, has been under consideration by the Departments of Agriculture and Interior for some time. The latest proposal is that a part of the area be set aside by the Department of the Interior as a national monument under the National Park Service for the preservation of the unique and interesting forms of desert flora and fauna to be found there, and that the remainder be placed under the jurisdiction of the Biological Survey, United States Department of Agriculture, as a wildlife refuge. The Mexican Government sent a representative with the Government and State party that recently explored this area, and it is understood that Mexico will consider the setting aside of a similar wildlife refuge between the international boundary and the head of the Gulf of Lower California.

Seemingly there is much to gain and nothing to lose in the setting aside of this land in behalf of the desert flora and fauna in general, the bighorn sheep, and the antelope. The move should help to provide adequate warden service. It should tend to forestall a few greedy and unscrupulous Americans who are reported by border officials to cross the line into Mexico, sneak back into the United States, kill their game, take it back into Mexico, and clear it into the United States as if it had been killed in Mexico. I understand that Mexico now has a law prohibiting hunting in a broad strip south of the international border, which also may help put a stop to the destruction that has been going on.

Attention should be drawn to one feature that has not, so far as I know, been discussed in any of these meetings; namely, the need for provision of conservation funds and devices in addition to those derived from hunting licenses based on sport. It is too much to expect the State commissions, which are scarcely ever sufficiently financed, to afford adequate protection to rare species, sometimes scattered over a wide area, from which species they derive no revenue.

To sum up the prong-horned antelope situation in the Southwest:

(1) It has been shown to be entirely practicable to maintain the prong-horned antelope under conditions now prevailing in the southwestern United States.

(2) In many cases the cowman is the key to the situation. It is possible and doubtless highly desirable to maintain reasonable numbers of antelope on the holdings of cow outfits over much of the western country.

(3) In some instances the question of winter range for the antelope is of a critical character, and can apparently be solved only through decisive action by some duly constituted Government authority.

(4) There is need for the setting aside of the proposed Cabeza Prieta Wildlife Refuge in southwestern Arizona and northwestern Sonora, Old Mexico, to protect the remaining Gaillard bighorn sheep on the isolated desert ranges of the region and to conserve and increase the remnant of prong-horned antelope in the valleys.

(5) The present population of antelope in the southwestern United States (Arizona, New Mexico, and western Texas), can be greatly increased if desired, and another big-game species of extraordinary beauty, interest, and value, built up.

Protecting Rare Birds in Europe

(By Dr. T. Gilbert Pearson, chairman, International Committee for Bird Preservation)

Many of the laws affecting bird protection in Europe are wholly different from those accepted as fundamentally important in the United States.

Here our State laws contain a blanket provision protecting all birds at all times, with the exception of certain game birds for which open seasons are prescribed and for a limited number of presumably injurious species which receive no protection. In most of Europe only certain listed species have protection, and any bird overlooked when such a list is made automatically becomes a legal outcast.

Various States of the United States and Provinces of Canada, as well as the Federal Governments of the two countries, employ in the aggregate thousands of men whose sole duty and business it is to enforce the wildlife protective laws. In Europe a State-supported game-warden force is unknown. The laws are supposed to be enforced by the police and other peace officers just as they were in this country before game-warden systems came into vogue.

Thirdly, in many countries, as for instance Great Britain and most of Norway, all game belongs to the owner of the land on which it is found. The only free shooting is on the shore between the tide levels. The governments, not claiming ownership to the game, take little active part in its preservation. Such work, therefore, is left to the landowner who generally employs guards to protect his game birds and to prosecute troublesome poachers.

In Europe I have never heard of a legal bag limit of any kind, anywhere.

In the United States, as a wildlife protective measure, we prohibit absolutely the sale of wild game birds. In Europe game is abundant in the markets and grouse, quail, and golden plovers are served in the dinning rooms of ships that sail the seven seas. At various international conferences in Europe, I have pleaded in vain for the adoption of resolutions calling for the stopping of the sale of all birds not raised on private estates. I recall that on one of these occasions a Swiss delegate said that such a law was not to be thought of for, as he pointed out, when a man kills a woodcock he can sell it for enough money to pay for his gunning license; and at a meet-

ing in Brussels last summer a delegate from another country urged that no one insist on prohibiting woodcock shooting in spring for, as he said, "We kill only male birds."

In the countries of southern Europe small birds are eaten extensively, this having been the custom of the inhabitants for hundreds of years. While attending a convention in Luxemburg on one occasion, I was approached by the state forester of Belgium who said that he had been sent by his Government to ask me to correct a statement I had published in an American magazine, in which I quoted a Belgian as saying that 6,000,000 small birds were annually netted or trapped in that country. The forester explained it was forbidden to catch small birds unless a netter had a permit, and that from the number of permits the government had issued the past year it was believed that not more than 3,000,000 birds had been taken legally, and he doubted if more than 1,000,000 had been killed illegally. Would I please correct the erroneous statement that had been made. I assured him that I would do so and I am here fulfilling my promise. According to his figures it would mean that in Belgium the previous year there were captured and used either for caging or for food an average of 500 birds for every square mile of the country.

Although France legally protects many of its small birds scant attention is paid to such restrictions, and throughout all of the southern half of that country the destruction of warblers, wagtails, swallows, and thrushes is very great. The French League for the Protection of Birds offered a prize to every police officer of France who would secure a conviction for violation of the bird laws. Through government official sources it was determined that even with the special inducement held out to officers, there were that year only about 100 convictions for the illegal killing or capturing of birds in all France.

In Italy I have seen many blinded birds kept in small cages to be used as decoys to lure other birds to the guns, nets, or limed twigs where capture and death awaits them. In northern Italy some 1,800 of the elaborate bird-catching device known as "roccolo" exist today. Usually these are operated by owners of large estates, for the "roccolo" is a rich man's device.

The European quail migrates to Africa in the autumn and returns in the spring. On both coasts of the Mediterranean they are shot and netted in great numbers. In 1933, 542,000 of these winter migrants were shipped by rail from central and upper Egypt to lower Egypt. Of these 440,450 were transshipped from the port of Alexandria to England, France, and Italy, where their throats were cut and they were sold in market.

Two and a half years ago Italy passed restrictions on the taking of quail, ducks, and other birds along the coast country in spring. This order recently has been rescinded as a war measure. Prohibited methods of taking wild fowl have been temporarily legalized and this year it is lawful to kill ducks and other wild fowl by almost any method until May 31, or as long as any migratory waterfowl are to be found in the country.

The number of people in Europe interested in bird protection is growing every year, and bird-protective societies are in operation in most of the countries. There is a very fine sentiment for bird

preservation in Switzerland, Germany, Holland, Great Britain, and the Scandinavian countries. Many reservations are being established, especially for the protection of various water birds. For the size of the country, Holland leads in work of this character, and such efforts are largely due to the energetic work of the Society for the Preservation of Nature Monuments. Important as these preserves are, when we come to consider the acreage they appear very small compared with the some 1,500 Federal and State, permanent and temporary, wildlife refuges in the United States, containing in the neighborhood of 400,000,000 acres, which, if combined into one area would make a region larger than Continental France, Germany, Italy, and the British Isles combined.

Bird conservationists of Europe are fighting to save some species which, within their boundaries, have greatly decreased in numbers. But the struggle is a severe one. The bustard and the capercaillie have disappeared from much of their western and southern range, although sportsmen's organizations attempt, here and there, to reestablish them. Flamingoes are now confined to the coast of France and Spain. The French League for the Protection of Birds secured a subsidy from the Government to protect a great swamp near the mouth of the Rhone River, known as Camargue, and for some time these birds were protected. Last year, however, the Government's appropriation stopped and guardianship of the flamingo colony came to an end. A large colony of white egrets found in that same region was dispersed when the trees in which they built their nests were cut away.

The rare Kentish plovers and stone curlews are receiving protection in certain sanctuary areas. The bittern, for 40 years regarded extinct as a breeding bird in England, has returned; and not long ago I heard two of them booming in the marshes of Stalham Broad, in Norfolk. Ospreys are rare today in the British Isles and the kite has disappeared, except on the Welch border.

Dr. Lonnberg, of Stockholm, reports that the return of bands placed on the legs of young hawks in Norway, over a period of 7 years, showed that at least 22 percent of these young birds had been killed. Hawks are among the least common of all birds in England and Scotland today. The gamekeepers have seen to this. Furthermore, in Great Britain there is a persistent demand for the eggs of rare birds and it is difficult for a golden eagle, a kit, chough, or Dartford warbler to so successfully hide its nest that it cannot be found and raided by egg hunters employed by some wealthy English oologist.

White storks have been growing scarce in western Europe for several years. Nothing can be done about it. Many of these birds simply do not return from South Africa in spring.

Bird lovers in Hungary are guarding the great Kisbalaton Marsh, hoping thus to save its vanishing spoonbills and egrets.

Fourteen years before the adoption of the treaty to protect birds between the United States and Canada, a somewhat similar agreement was entered into by various countries of Europe. It is known as the Paris Treaty of 1902, and is in force today in Austria, Belgium, France, Germany, Greece, Holland, Hungary, Luxemburg, Monaco, Portugal Spain, Sweden, and Switzerland—13 countries in all. Its declared object is to protect birds useful to agriculture.

It is not a satisfactory treaty either to the birds or to the bird lovers of today, as it protects only about 149 species. And even these are assured immunity under the treaty only between March 1 and September 15. That is, for 5½ months each year it is no violation of the treaty regulations to kill and eat song birds. The treaty also specifically condemns as noxious birds all species of eagles, nearly all hawks, jays, bitterns, herons, cormorants, grebes, and the great lumbering pelican. By national laws the birds in some European States now have better protection than is afforded by the treaty.

What is Europe doing to protect its rare and vanishing species of birds? An earnest minority in every country is doing its best to secure better laws, establish more bird sanctuaries, abolish oil pollution along the coasts, and educate a reluctant public to discard some of its age-old customs of eating all manner of birds.

Among the 26 National Sections of the International Committee for Bird Preservation, 17 of these are operating in European countries. The committee already has held six international conferences, and has published and widely distributed four extensive bulletins. It was launched in London 14 years ago under the leadership of the National Association of Audubon Societies, which has continually fostered its efforts with funds which I have personally collected from individuals for that specific purpose.

Many conservation leaders in other countries look to North America for suggestions as to how they can make more effective their own efforts, just as we are learning various lessons from our European cooperators. For example, we should adopt the method now in operation in Germany and Holland of illuminating lighthouse towers with electric lights to protect birds during migration.

At this conference in Washington there are present representatives from all the North American countries seeking to gather inspiration and to give and to receive benefits which always are derived from the exchange of ideas and experiences. We may feel sure that our comrades in many other countries of the globe are waiting with interest to learn what takes place as a result of our earnest deliberations at this time.

DISCUSSION

Dr. Palmer commented after the reading of this paper by saying there are certain strains in southern France which have certain of the characteristics of the old cattle; this is produced by breeding strains and they would be hardly indistinguishable from the original stock and experiments are under way along this line and it may be successful in the near future.

Mr. DeFrothingham asked why the waterfowl in Great Britain did not seem to diminish with all the shooting they do?

Dr. Palmer said he thought it was a reservoir for Asiatic fowl that is constantly coming into Europe. There are not as many duck hunters in Great Britain as there are in this country.

A Plan for National Conservation

(By Arthur N. Pack, president of the American Nature Association)

Our discussion of the problem of vanishing species of wildlife this morning has indicated very clearly our dependence upon the

bureaus of the Federal Government in any attempt to cope with the situation. Where one bureau alone is involved the problem is comparatively simple, but where two or more bureaus or departments are concerned, we find immediately that it is very difficult to accomplish anything. This was the reason for Mr. Leopold's excellent suggestion for an interbureau committee.

There is every reason to avail ourselves of whatever help an interbureau committee can give, but after all such a plan is merely an attempt to patch up the creaky wagon of Federal conservation activities with a fifth wheel. What we really need, as soon as we can get it, is a new wagon.

The crux of a large majority of our national wildlife management problems lies in the necessity to correlate summer and winter range. How can we ever make any real progress until we squarely face the issue of putting both the "summer ranges" of the national forests and the lower "winter ranges" of the public domain under a single fully coordinated and centralized management? How can we gain for wildlife management the benefits of the several studies made by the National Park Service, the Biological Survey, the Forest Service, and the States, unless we have a real authority to coordinate their researches and promote their use?

Now, I do not wish to be understood as urging Federal versus State control of wildlife. I believe in the rights and benefits of State control, but at the same time I do believe that a centralization of Federal bureaus having to do with wildlife is necessary to obtain proper and necessary Federal cooperation with the States.

Most of you know, I am sure, of the Clarke-McNary Act, which authorizes appropriations for that bureau of the Federal Government charged with promotion of forest conservation, so that it may cooperate with and extend financial aid to States and other institutions for the furtherance of forestry. That principle is a sound one and could very easily be extended to include wildlife as a natural resource needing similar conservation. Thus direct Federal aid to the States for wildlife conservation could be obtained without sacrificing State control.

Our difficulty at present is that there is no single Federal agency capable of administering a Clark-McNary Act for the benefit of wildlife. Biological Survey, Park Service, Forest Service, Bureau of Fisheries, Bureau of Education—all have separate functional or jurisdictional connection with the single problem. Each can do but little. Each can start a project, but this will be, after all, almost completely useless, because it can never be fully coordinated and finished. The money is therefore practically wasted on half a jig-saw puzzle that can never be put together into a finished picture.

The sportsmen and the sheepmen have both been named this morning as having blocked conservation measures. Perhaps it is true that sheepmen are doomed to be forever enemies of wildlife conservation, but the sportsmen ought to have conservation at heart fundamentally. They are held to be against us because of a narrow-minded group of game hogs who often get control of the sportsmen's organizations. Their opposition is partly aggravated by the fact that the sportsmen deal chiefly with separate Federal bureaus, which are thus constantly influenced along a single line of exclusive interest that defeats the ultimate aim. The sheepmen are also able to defeat us because they,

too, can press their selfish objectives with separate Federal bureaus which do not, at the same time, have to take into consideration wildlife and land conservation problems.

Now, let us look at the picture under a revised and centralized set-up of Government conservation activities. If we had a single bureau or department for the conservation of renewable natural resources, a single Federal authority charged with the administration of public lands, then the influence of one group of citizens, such as sportsmen or sheepmen, would be considered against the influence of another. True conservation would no longer be sold out to the political influence of one faction alone. Actually, instead of both the sportsmen and sheepmen groups being against those who are merely trying to save our natural resources, the sportsmen would be the first to join in any effort to control the sheep industry within reasonable limits.

To illustrate the possibilities of such cooperation, I should like to mention the so-called New Mexico plan. Here in my home State we have gotten together conservationists, land users (both cattlemen and sheepmen), sportsmen, and State game officials to discuss the mutual advantages of all, and, strange though it may seem, that committee, known as the Land Use Committee of the State, has found it possible to agree. No one group is urging upon any Federal bureau policies contrary to the interests of any other group in New Mexico. Recently the cattlemen and wool growers actually refused to accept a set of regulations under the Taylor Act until those regulations were extended to include the provisions for wildlife conservation, which the committee as a whole had agreed upon.

The secret lies in the consideration of all conservation factors at the same time, not just one factor alone. The solution lies in realizing that all forms of conservation of renewable natural resources have a definite economic value that redounds to the ultimate benefit of all. Sentiment, yes, but sentiment, too, has its aspect of real dollar value. We treat it from that viewpoint, and we get along.

Now, a centralization of Federal bureaus is nothing more than a land use authority in the Federal Government with power to act as a unit and get something done. After all, the money has to come from Congress, and the citizens of the United States can control that. It seems to me that a centralized bureau or department of conservation is no more to be feared than the present jumble of bureaus which are still capable of doing harm and yet are unable to accomplish the maximum of good.

It has been pointed out that bureaus in Washington are not to be altogether blamed for present conflicts and so-called jealousies, but that the real trouble is down in the roots where the selfishly interested factional supporters of the various bureaus make their demands. That is largely true. These factions have in the past prevented bureau reorganizations. The demand for reorganization, however, will have to include these factions, awakened at last to see the economic advantages of the move. Now is the time for us to work toward that end.

Now is the time because, inevitably, the present scale of Federal spending must soon give way to an overwhelming demand for Federal economy, and there is now only one way to get that economy

without sacrificing the pet projects of each and every faction. I refer to the practice, common in the past, of a flat percentage of appropriation reduction, which, we all know, satisfies no one and ruins the value of useful Federal services. The one way to obtain real economy is to eliminate duplication and prune scientifically, according to a reasoned plan. Nothing short of complete bureau reorganization will really work. If we, here, were willing to get together on a basis of mutual sacrifice for the common good, we could work it out.

In closing, let me say that the American Nature Association has drawn up the outline of an actual plan. Many will think that we have rushed in where angels fear to tread. All right. We accept the accusation. But, my friends, we hold no brief of infallibility. I, for one, should be only too glad to sit at a table with representatives of every group, and try to come out with something which we could stand behind, even if it wasn't exactly according to my own pet ideas. I would urge only that we keep before us the fundamental idea of unity of territorial jurisdiction, which theory, I think we should agree, is the only one capable of practical operation. We must not allow ourselves to be misled into some fine theoretical scheme of having one bureau for recreation, one for wildlife, one for trees, and so forth. Research can be functionally coordinated, but land must be regionally administered in units wherein all its uses can be interrelated on the ground itself.

It may be that all Federal land cannot be lumped together. It may be that all Indian lands, for example, have to be separately considered as a specific and separate type of ownership. It may be that National Parks are also a specific and distinct problem. Nevertheless the fact remains that most public lands are capable of several different uses, and those uses must be coordinated for the benefit of several needs and the exclusive purposes of none. In this way we may obtain a national plan for conservation.

DISCUSSION

Following Mr. Pack's talk Mr. Shellford, Illinois, entered into a discussion as to the appropriateness of placing a newly informed bureau under the Department of Agriculture. He said that in Canada the national parks and areas for the preservation of wildlife where such resources are not renewable should not be under agriculture. Fundamentally agriculture is concerned with the modification of the original species and if you set up a bureau such as has been described you will have lots of opposition along that line.

Mr. Pack said the details of a plan had not been actually worked out and the American Nature Association had no idea of attempting to side with one Government department against another. He said a group like this should consider the broad premises involved. The idea is "Can't we accomplish something by getting conservation and renewable natural resources together—separate them from the conservation of those resources which are more or less of an engineering or mechanical nature."

Dr. Palmer said that Mr. Pack was correct—it should be done, but the question was, how to do it? He said there has been a similar

problem of late years in the aviation service. There have been movements on foot to place aviation under one department, but it still remains under three departments and they seem to be going ahead. We have much the same situation in conservation. When you transfer one department to another department, it takes an Executive order to make the transfer, or an act of Congress. A bureau, like a tree, is made up of three parts—it has the trunk that you see—the tree has a crown through which it obtains the nourishment, through a Cabinet officer speaking to the Budget Bureau regarding appropriations. A plan submitted 2 years ago to the wildlife hearings recommended an under secretary in charge of these activities. That was not sufficient. The under secretary could not speak in the Cabinet in time of trouble and he could not go to the Budget Bureau. Every bureau, like a tree, has roots, and the roots are the organizations which deal with it, assist it, work with it.

Very few of the plans proposed in Congress the last 10 years have taken into account these organizations. That is a fundamental question. We have to take care of the appropriations and the organization which stand back of the bureau. Last week a speech was made in the House of Representatives indicating a modification of this plan, and it was recommended that those bureaus dealing with land usage, except the Park Service and the Bureau of Mines, should be in the Department of Agriculture. It avoids some of the difficulties of the others. It will undoubtedly create opposition along those lines. How are we going to make any more headway than aviation did?

Mr. Pack said that the American Nature Association has submitted a plan along the line of what has been referred to on the Congressional Record. It contains features similar to those in that bill. "I think if there is a real desire to do something about it, not only in times of Governmental prosperity, but in Governmental depression, it is possible to win Congressional support of this kind. * * * All bureaus suffer in times of depression. The bureaus should put aside petty jealousies and work out some plan. I hold no particular brief for it in detail. There are great difficulties. In spite of the great amount of talk over a period of years, it needs more support than it has had. I also agree fully with you—a bureau having a crown, a trunk, and roots. I think this wildlife federation is one example of which roots can get together. These bureaus are concerned with environment and it is possible to get at this thing only from the roots and not from the top. It is at the roots where the appropriation comes from. The roots are the important things to determine how we shall get the plan together. Congress would rather hear from the roots than from the crown.

If there are good and sufficient arguments for keeping the national parks in the Department of the Interior, does it prove the Department of Commerce shouldn't get together with Interior on fisheries? They are very interrelated in Alaska with the conservation problem there. We are also prone to get an idea in bureau reorganization that here is our game, here is recreation, here is soil. If we can get a bureau that can handle all those things * * * distribution of authority. One of the things I would like to warn against is the functional redistribution of bureaus where Federal land is con-

cerned. We must have territorial unity. If the objectives are kept in mind, if my friends of the Park Service and your friends of the Forest Service will realize in suggesting such a plan, we are not favoring any political combination against one bureau to oppose another but keep the refuge problem unified on the one hand and the territorial administration performed in the best possible manner on the other hand * * *. Mr. Marshall commented somewhat as follows: "I agree with what Mr. Pack has said. It is a better system of administration to avoid functions between bureaus. It is most dangerous having one administer forestry grazing, fishing, and hunting. Anybody knows there will be friction when you have bureaus of different chiefs. I agree with Mr. Pack that a bureau has to be administratively under 1 head and not 10.

Mr. Lally from Washington commented upon the worrk that regulation G–20A and the Taylor grazing bill had caused the people in Washington. He said that if a concentration of authority were to come into his State or any State and tell them how to regulate the department of game, you will strike opposition right from the start. He said domestic sheep was the big question out there. What has become of game? The sheepmen have gotten rid of it.

The Last Call for Game Salvage

(By William T. Hornaday, director, Permanent Wildlife Protection Fund)

In every sense of the word, and covering the whole field, I think this conference is in practical effect and virtue the last call for the protection and restoration of the small game of the United States and Canada. We deplore the spirit that would scrap conservation for the visionary and uncertain substitute called restoration—meaning restoration along with continuous shooting by millions of guns.

Let no man or men talk to me about other causes than shooting by sportsmen for game decrease or extinction. I am no stranger to those causes.

For 37 years I have been taking all those evils and alleged evils into account. During that time we have seen the rise of the automatic and pump shotguns and rifles, the development of long-range smokeless powder, the continuous flood of hunting automobiles, the development of live decoys and grain baiting, and a 10-fold increase in hunters, sportsmen, and commercial killers of game. We also have seen the rise of the crow and the jaeger, the outrageous commercial club, the deadly sink box, and the fisherman's net for diving ducks. Finally, America has acquired the weak-kneed judge, the sympathetic juror, and the keen lawyer who makes the conservation of criminals the chief business of his life.

Today, the latest figures available reveal the presence in the United States of about 5,750,000 licensed hunters, not counting, nor even guessing at, the additional millions of men and boys who annually shoot all that they can shoot of game and pseudo game, either lawfully or unlawfully.

I think that many fine-spirited men who shoot wild birds and quadrupeds today are utterly unable to visualize or comprehend the devastating power and deadliness of the 48 grand armies of well-armed killers who each year go out against our cowering remnants

of small game, and kill all of it that they can find and bring down. Nor does the nonkilling mind realize the heavenly joy that the confirmed killers of game find in seeing birds and quadrupeds collapse and fall lifeless before their unfair and deadly repeating guns. The love for bobwhite of the tender-souled gentleman whose final ecstacy is found in bob's descent to the frying pan, is too impressive to be wholly ignored.

In the past, the conservationists have lost years of valuable time in trying to educate sportsmen and relentless hunters out of their destructive ways. We have had some success, but we also have made countless failures.

Today the average American game-killer stands before us sharply revealed. There is no need to entertain any illusions about what he thinks, or what we can do by amalgamating conservationists and killers in the very serious and ugly business of trying to salvage our remainders of game. If we cannot now enlist the sympathy of the conscientious sportsman and secure his mass support for game salvage, then failure will be our portion, and extermination the fate of our small game species.

We could pause here, and hold up before you a long series of trials and failures, successes and defeats, and cite the expressions of contempt now coming from the opposition because our restrictions on hunting have not already saved the game from the swarming hordes of hunters that Mr. Darling has so well described in Today magazine for November 2. I will, however, pause long enough to tell you that not one State ever has been able to put into the field, in any hunting season, an army of game wardens large enough to watch every hunter, separate the sheep from the goats, and prevent all secret and underhanded overshooting of the legal bag limit, the crippling of millions of birds every hunting season, and the criminal sale of game. In other words, we confess that no State ever has been able to protect all of its game 100 percent from the dirty practice of the mean game-hunter contingent.

It is a lamentable fact that the Federal Government literally has been compelled to force upon the uncompromising hunters a round dozen or more of new shooting restrictions that many State game commissioners dared not initiate independently. And knowing as they do, even in their bitterness, that those restrictions are needed and are in the interest of sport continuance, it is a curious fact that the bitter sportsmen do not rebel after the reformations are made.

But alas, what has it all availed? Something; but not everything. The appalling upward thrust of the increasing sportsmen millions, the increase in guns and deadliness, and the pressure of other evils upon the hapless birds and beasts, have kept the game plunging downward, straight toward general extermination in the near future. It is impossible to discuss here the evidences of general game disappearance.

Well, what is the conclusion of all this? Most willingly we will try to point it out. In the first place, our waterfowl are now at the lowest point ever known. Because of posted lands and privately owned duck-shooting places, "free hunting" in the United States is almost dead.

A big national organization, composed of 10 percent of true conservationists and 60 percent of uncompromising killers of game never will restore or save enough game to stock the smallest State in this country. To make such an experiment would be an utter waste of time. But I am quite sure that the sportsmen of America could save from extinction the small game of America—if they would.

I fear that the sportsmen of this Nation never will effectively lead in saving and managing the game of this Nation against the insistent demands of the forces that still savagely defend continuous shooting, and evade the law against baiting, as now is being done in California, and some other places. Our resolution for the recommendation of a 2-year closed season on waterfowl in 1936 and 1937 will, if enacted this year, go far toward showing what the fate of our small game will be by 1940.

I think that the real sportsmen of the States and the State game commissions alone never will be able to save the upland game of the States against the opposition of the hard-boiled killers who recklessly demand something to shoot for their money. If any upland game ever is saved for posterity, I think it will be done by the State legislatures, and regardless of game-killer protests.

It may be regarded as absolutely certain that the migratory game of this Nation never can be saved from extinction and conserved otherwise than by enactments of the Federal Government, backed up by the real and effective enforcement of Federal regulations by the various State governments, vigorously assisted by the Federal Government, and conscientious sportsmen.

It is not at all probable that this Nation ever will see the day when the crime of poaching will be punished here as it has been for a century in some of the nations of Europe, where the maintenance and the hunting of game are governed by ironclad regulations that are a genuine terror to evildoers.

CONCLUSIONS

And now let us briefly sum up the present small-game situation and reach a logical conclusion to guide our last emergency effort for waterfowl salvage.

With but slight and widely scattered exceptions, the small game of the United States is now down to its dregs. Waterfowl are fairly plentiful in two or three States, but only three duck species can be called fairly abundant—mallards, blacks, and pintails. If ducks are shot until those three species grow scarce, then the sure result will be the extinction of all waterfowl species. The native upland game birds are, in the north, center, and west, seemingly in a worse condition of peril and scarcity than the waterfowl.

It now has become utterly futile to rely upon the sportsmen and hunters of this Nation to voluntarily give drastic protection to game or to prevent the lawless elements from poaching, killing illegal bag limits, and impudent trespass upon posted farms. No longer, it is said, is there any good free hunting for the unorganized hunter.

The effort to induce American farmers to raise game for strange hunters to come in and kill for a head fee has, in the main, failed to produce wide or important results.

No State can breed or buy even one-half enough coop-reared game to supply even one-half of its licensed sportsmen with something to shoot. In most localities the hunting of small game has come down to rabbits, squirrels, alien pheasants, and woodchucks.

The logical conclusion of the waterfowl crisis is not at all distant or obscure. Any remedy to check the downward plunge must be quickly, widely, and forcefully applied. Slow-moving and dilatory measures mean sure and certain calamity. The one sensible reform measure that still gives a fair promise of some success is the stoppage of all wild-fowl shooting for 2 full years—not 1 only—and a firm enforcement of the regulation. In 1935 great Federal measures were taken by President Roosevelt for Federal game salvage. Who will help him to carry them further? It is time for the last follies and crimes in game slaughter to be sternly thrust aside before it is utterly too late to save the breeding stocks of game that possibly would be able, in spite of all natural obstacles, to bring back a fair supply of waterfowl for the indefinite future.

Incidentally, American sportsmen and their organizations should at once, and liberally, contribute cash to Canadian officials for the destruction of crows on the breeding grounds of six Canadian Provinces, and somebody should subscribe something to Mr. Jack Miner's funds for the maintenance of his wonderful feeding station for migrating ducks and geese near Detroit. Canada breeds our waterfowl; Americans kill them.

Finally, we warn the American people to awake, and beware of the great impending disaster, and back up President Roosevelt in doing one more big thing to avert it.

The power to stop all waterfowl killing in the United States in 1936 and 1937 rests in the hands of the President, the Secretary of Agriculture, and the Chief of the Biological Survey.

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